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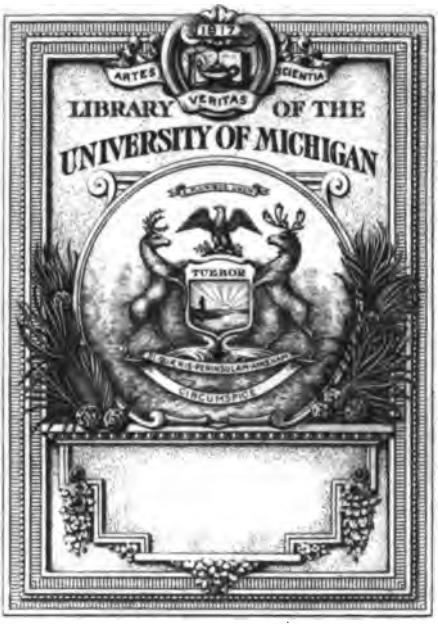

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APPENDICES C TO S

INCLUSIVE,

CONTAINING EVIDENCE TAKEN BY THE COMMISSIONERS, SPECIAL REPORTS, ETC.,

IN

VOLS. III., IV. AND V.

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ONTARIO AGRICULTURAL COMMISSION.

APPENDIX C.

EVIDENCE

RELATING TO

FRUIT GROWING AND FORESTRY.

ONTARIO AGRICULTURAL COMMISSION.

APPENDIX C.

EVIDENCE

RELATING TO

FRUIT GROWING AND FORESTRY.

Sitting to take oral evidence, held at Toronto, June 10th, 1880. *Present*—Mr. WILLIAM SAUNDERS (Chairman), Hon. S. C. WOOD, and Messrs. J. B. AYLSWORTH, W. BROWN, E. BYRNE, A. H. DYMOND and JOHN WATSON.

MR. BEADLE'S EVIDENCE.

D. W. BEADLE, St. Catherines, was called and examined.

To the Chairman.—I represent here to-day what is known as the Niagara District. I suppose it embraces the peninsula between the two lakes, from Hamilton to the river, but more particularly the area lying below the mountain. I have had opportunities of familiarizing myself with the fruit-growing capabilities of that district, and the character of the fruits grown in it. I have had experience in fruit growing nearly all my life with the exception of a few years that I have not resided there; but my experience has been especially within the last twenty-five years. I have been connected with our Agricultural and Horticultural Societies, and Fruit Growers' Associations in some capacity or other during all the time I have mentioned. I am Secretary of the Ontario Fruit Growers' Association. I have been in that office about twenty years.

THE FRUITS OF THE DISTRICT.

The class of fruits that has particularly claimed my attention is that embracing those which are readily cultivated in our district, such as apples, pears, plums, cherries, peaches, —in fact all those that are cultivated in our climate, or all those that flourish in the temperate zone. In addition to these I may mention grapes, strawberries, currants, raspberries, etc. Apples are the fruit by far the most cultivated; peaches will rank next, and plums will come third. Not more than one-third the trees in our district are in full bearing. About six years after apple trees leave the nursery we begin to find them make some return; some will bear a little in three years, some even earlier—but the average would be about six years. Some varieties are exceptional; the Red Astrachan and the Duchess of Oldenburg will bear in two years. The Northern Spy is quite late, and attains considerable size before it bears—about ten years I should say. I can give very little idea of the proportion of land occupied by strawberries, raspberries, grapes and other small fruits, in our district—but it is not very large. There are a number of small patches of one or two acres each, cultivated by individuals, and those are all I can speak of I know of no extensive plantations of five or ten acres. There are not very many large vineyards—one or two of perhaps five acres in extent—in our neighbourhood. As

to the quantity of apples produced in our district, we would require to have a Statistical Bureau of some kind or other, in order to give a reasonably accurate answer, for at present we have no means of knowing. The shippers are scattered all over the country. I suppose the owners of the boats at St. Catharines, and the railway agents, could account for a good many, but there is no way of obtaining anything like correct statistics. I could not give you an approximate idea, but I know there is a considerable quantity, and that in the autumn it is difficult for men who are shipping fruit to get it off as fast as they wish.

Apple and Peach Culture.

There are a good many apples of both winter, summer and fall sorts grown in our district. Those who grow for market purposes, or make that their special aim, have found that the winter apples are most profitable, and are confining themselves mainly to winter varieties. To some extent the older orchards, embracing the summer varieties, have been grafted, but not very generally. The old orchards of the country were largely seedlings and they have given way to grafted fruit. Apples will succeed in any soil, so far as the surface is concerned, but they require a well-drained sub-soil. A porous sub-soil is essential; they will not thrive in a cold, wet sub-soil, coming at all near the surface. We are not troubled in our district with the question of the most favourable aspect. If I were planting a peach orchard I should prefer a northern aspect, because it is sheltered from the prevailing winter winds and retarded in spring, for if the blossoms are not prevented from coming out too early in the spring they are apt to be caught by the late frosts. I have noticed that peach orchards growing on the north side of buildings, forests, etc., and sheltered so as to have their growth retarded in the spring, are much more likely to give us a good crop of fruit. One cause of the destruction of the peach crop is that the warm suns of early spring start the sap, then comes a cold night, and the blossom bud is killed before it opens at all. I therefore prefer an aspect by which the trees are sheltered from the rays of the sun in the early spring. Apple trees in our district are planted thirty feet apart; some plant them thirty three and one-half. Many of our orchardists who have a suitable soil will plant out a young apple orchard with peach trees in the intervening spaces, and thus get several good crops of peaches before the apple trees become sufficiently large to interfere with one another or with the peach trees. Peach trees are short lived compared with apple trees, and they give a sufficient return to pay before the apple trees come in. Standard pears are planted about twenty feet apart; cherries and plums about the same. Peach trees are planted about twenty feet apart, though they may be planted fifteen feet apart when there are none but peach trees in the orchard, and when they are properly pruned and well kept back. Twenty feet is, however, the usual space.

To Mr. Brown.—I should hardly say that apple trees would bear profitably two years after being planted in the orchard, though certain varieties make some return at that age. The Red Astrachan, the Duchess of Oldenburg, the Keswick Codlin, and the Wagener will bear at three years. There are some varieties that bear early, and yet are not very generally planted for market purposes. I have no data upon which I could give the Commission an idea of the average product per acre of the average varieties of apples. The mode by which I could make anything like an estimate would be this:—At thirty feet apart there are so many trees planted upon an acre, and from what I know, the average yield of apple trees, after being planted seven or eight years would be about two barrels to the tree. I could not give you the estimate from practical experience in handling an orchard, as that has not been in my line. I should think it would be a poor orchard that would not give an average yield, annually, of $1 per tree. Taking the average price for the last ten years, $1 per barrel, that would only be one barrel per tree. What I have said as to the question of aspect being of no importance to an apple orchard does not apply to the Province over, but to my district.

To Mr. Aylsworth.—My remarks as to the age at which apple trees begin to bear fruit are based upon the consideration, that the average age of planting is about four years from the graft. Some trees will reach a good size for transplanting at three, others at

five years, but the average, I think, could be safely put at four years from the graft. Very much, of course, will depend upon how they are treated after planting in the orchard.

Fruit Growing in Ontario.

To Mr. Dymond.—To some extent my knowledge of fruit-growing extends to the whole Province, though chiefly confined to the capabilities of the district I represent. As a Province, I should say we are able to grow any fruits that are grown in the temperate zone. We can grow some fruits in our district that cannot be grown in some other parts of the Province; for instance, we can grow the peach to perfection. It can be grown along the shore of Lake Erie; but it cannot be grown in the County of Hastings. In fact, going north of Toronto, with the exception of a circumscribed district in the neighbourhood of Meaford, the peach cannot be grown. My remark that not over one-third of the apple trees in our district are in full bearing, implies that the planting of young trees has been going on at a largely increased ratio during the last few years. There has been a large accession to the fruit culture of that district, especially as regards apples, during the last few years. Though it is still going on, I don't think the ratio is increasing. The Northern Spy is a very fruitful tree, when it begins to bear, but I don't know that it compensates by its fruitfulness for the time required to bring it to maturity, and the great care required in order that it may produce perfect fruit. It is a very long-lived tree, notwithstanding that it is so prolific. I think ours is as good a grape-growing district as most others in the Province, though, perhaps, not quite so good as some of the islands and promontories of Lake Erie.

Statistics of Fruit Culture needed.

I think no attempt has been made in taking the census to obtain statistics of the quantity of fruit produced. My impression is that no information is sought of the area of land under fruit culture. The Fruit Growers' Association have several times called the attention of the Dominion Government to the importance of obtaining these statistics. The President of our Association reported at a meeting held since the last exhibition in Ottawa, that he had had an interview with the Minister of Agriculture on the subject, and that he had assured him that steps would be taken towards securing such statistics in the next census enumeration. Though a decennial return would be of some value, it would be better to have them more frequently, and they would not be quite satisfactory unless they were made yearly. I think such statistics could be obtained without much trouble or expense by the officers of municipalities in taking the assessment. They could obtain the information if suitable questions were inserted in the blanks.

Advantages of Under-Draining.

Where the sub-soil is unfavourable for the growth of apples draining should be resorted to; but I cannot say that it is generally done in our section of the country. We are, perhaps, as well advanced in that respect in our section as in any part of the Province, but I am afraid our farmers are not alive to the value of under-drainage. As editor of *The Horticulturist*, and formerly of the fruit department of the *Canada Farmer*, I have called the attention of farmers and fruit growers to the importance of under-drainage. Given an orchard upon an unfavourable soil, and the proportion of increase which would result from proper drainage would amount to all the difference between profit and loss. Just for the time being it would probably make no difference in the yield, except that an orchard on unfavourable soil would gradually go down, while the one on favourable soil, properly drained, would go on increasing in value.

Summer, Fall and Winter Apples.

To the Chairman.—The Red Astrachan and Early Harvest apples are the most profitable of early summer apples. I think, taking one season with another, $1 per barrel

is the average price realized for early summer apples, including the cost of the barrel. I don't think the local demand is sufficient to consume all the summer apples grown in our neighbourhood, as considerable quantities are shipped to neighbouring cities and some to Toronto and Montreal. I am not aware that there is any marked difference in the carrying qualities of the Red Astrachan and the Early Harvest apples; they both carry well so far as I have observed. The varieties of fall apples most profitable to the grower are the Duchess of Oldenburg, for early autumn; the Gravenstein; then a little later will come the Cayuga Redstreak and the Blenheim Orange. Those four varieties command the highest price. I have sold the Duchess of Oldenburg in Montreal at $4 per barrel. Taking one sort with another I do not think that the average price would be more than $1 per barrel for the fruit. The varieties I have named also succeed best as to hardiness and productiveness. I have included the productive quality of the tree and the saleability of the fruit. If I were going to plant in a cold northern section of country I would prefer the Duchess of Oldenburg to the Cayuga Redstreak. The Blenheim Orange will do well pretty far north, but not so far north as the Duchess of Oldenburg. The latter can be planted as far north as any apple I know of in that class. When you speak of my own district I don't think there is any difference in point of hardiness. I have not cultivated the Benoni Apple at all. In regard to fall apples the supply is in excess of the demand. There is a large quantity of fall apples in our section that go to waste every year, and I have often wondered that some company did not take hold of this surplus fruit and dry it, as is done, I am informed, in the United States, with great success and profit. The varieties I have named are the most suitable for shipping to other parts of the Dominion and to the United States. There is a long list of fall apples I could give you that find their way into our local markets, but are worth very little for shipping. Speaking of the price of these apples that are shipped, much depends on how they are put up, and with what care they are selected. Of the varieties cultivated in our district which I would not recommend, there is first the Fall Pippin. It is a poor bearer, and shows bruises badly by discoloration. The Holland Pippin is a cousin of the Fall Pippin, and used to be very popular, but it is found that it is not valuable for shipping or market, compared with the others I have named. The St. Lawrence is another which it would not be profitable to grow in our section of the country. The Hawley is another which is not profitable. It is a large showy apple, but the flesh is soft and it perishes soon. Taking all points into consideration the varieties of winter apples most esteemed in our district are, first, the Baldwin, which is head and shoulders above all the rest, and is more planted than any other variety. Next to it the Golden Russet, then the Rhode Island Greening, then the Roxbury Russet. The reason that these are favourites in the district is that they are well known varieties; the people have become acquainted with them; they sell rapidly, and they have good qualities to recommend them for use. There is another variety that is much esteemed by those well acquainted with it—the Pomme Grise. There are two varieties of it—the Swayzie Pomme Grise and the Montreal Pomme Grise—the latter slightly different from the other in colour and flavour. The Snow Apple (Fameuse) has been popular and is popular still when we can get it in perfection, but during the last decade it has spotted so badly, almost every year, that we cannot do anything with it—cannot get it to market.

Q. Are there any other varieties that you can add, which you think from your knowledge of the trees, their habits, fruitfulness, etc., would stand equally high with these if sufficiently planted and tested to the same extent? A. The King of Tompkins County is spoken of by many as a fine variety of apple and profitable to grow, and if any one should wish to try another variety besides those I have named for market purposes, I would suggest that one, though I have my doubts of its success. The Northern Spy from the fact that it is so late in coming to bear, and also that it requires so much care after it does bear, has not attained a very high position among our orchardists. I only know of one orchard devoted to the Northern Spy and that is in the County of Halton. In it there are several hundred trees of that variety. When it first came into bearing I used to hear a good deal about it. Mr. Springer owned it then and he used to bring samples to our meetings, but I have heard nothing of his success for the last few years. Speaking

from recollection of my last conversation with him, he was meeting with the difficulty I have spoken of—that there was such a tendency towards bearing large crops, the labour of thinning out was very large; and unless you can get well developed specimens they are useless. As to the Wagener's qualities as a winter apple it is not a long keeper, and must be used in the first half of the winter. So far as my observation goes, it has not been very largely planted in our section of the country. I have conversed with Michigan men who are trying it, and they like it; but I find that after all it will not keep long enough to be very much sought after as a market apple, particularly for sending long distances. It would do very well for the home market or others near by, but it would not do to send across the Atlantic. The Ben Davis is a showy fruit, and if I were planting in Prince Edward, or down in that section, I would try that apple largely, as it grows well there, and stands the climate. The Baldwin does not always succeed there: in fact I would not plant it in that section of country. I don't think the Ben Davis is of as high a quality as the four I have named—still it will sell. The four varieties which I have mentioned as being most esteemed succeed best as market fruits. I don't think there is any preference to be given as to which is best for the home market, as they are all greatly sought for.

Q. Would you put the varieties you have named in the order in which you have named them as regards their profitableness for export? You mentioned the Baldwin, the Golden Russet, the Rhode Island Greening and the Roxbury Russet? A. No; I should put the Rhode Island Greening last for export to Great Britain—in fact I should not send it. The order for export would be the Baldwin, the Golden Russet, the Roxbury Russet, and the Pomme Grise. Some of my neighbours have shipped the King of Tompkins County to Great Britain and have found it sell well. As a general rule what is wanted for the European market is a medium sized, high coloured fruit of good quality. Such an apple will sell better than a green or yellow fruit.

Q. In the list you have given you have only mentioned one—the Baldwin—that is high coloured? A. Yes; the others come under the head of Russets. We have not yet settled upon any other apple that will bear transportation, keep long, and is high coloured and productive, that will stand side by side with the Baldwin. The longest keeping apple of any that are generally planted is the Roxbury Russet. The Golden Russet, the Pomme Grise, and the Northern Spy are all good keepers. The Baldwin is also a good keeper, as are all the winter varieties I have named. The Rhode Island Greening is perhaps the poorest keeper of them all.

Method of Keeping Apples.

As to the best method of preservation, it is to keep them in a cool cellar, with a temperature just above freezing. When the thermometer begins to rise in the cellar, and the weather is cooler out doors, open the window—in fact I sometimes keep the temperature so low that water will freeze. I head them up tight in the barrels, and they come out sound if they have been properly selected and kept cool. I should say that of the winter apples grown in our neighbourhood about two-thirds are shipped and one-third remains at home. Taking one season with another, the average price realized for winter apples is about $1.25 per barrel. I don't think there are any good seedling apples cultivated in our district that are not generally known. None of the standard varieties of apples have proved too tender for cultivation in the Niagara district.

Apple Blight.—Insect Pests.

At times the apple trees suffer from a blight at the ends of the shoots. We had a period of it a few years ago, when it seemed to go like an epidemic through the district, blighting the ends of the twigs and blossoms just as they were forming into fruit. It very materially affected the crop that year, but it seems to have passed away. I noticed it this year again in the County of Welland, around Drummondville. But what appeared singular to me was that the trees which had no fruit upon them were almost entirely exempt from it—or at least were affected very slightly in comparison with the others. The blight, however, has never

been so serious as to make it a matter of alarm to the orchardists. The borers have not been very destructive to the trees. I have seen some young orchards injured by them. The borer from which they suffered has been chiefly the striped one (*Saperda Bivittata*). They would be much more destructive if they were not looked after. Caterpillars sometimes destroy the foliage of the trees. To destroy the borer we wash the bodies of the trees with an alkaline solution—sometimes soft soap with a little water, stirred up so as to make a pretty thick wash. Some use potash dissolved in water. It is usually applied in the month of May, so as to prevent the insect from laying its eggs. I don't know if the insect knows enough to keep away from such trees, but I know that if the alkali reaches the egg of the insect it is sure death to it. Sometimes the insect gets into the trees before the orchardist is aware of it, and then the only way is to hunt them out with a knife or a piece of wire, and at the same time apply the wash so as to kill the larvæ. They are usually found at the collar of the tree. After they are grown a little they may be detected by the saw-dust at the foot of the tree. There is also a discoloration of the bark which can be detected by the practised eye. The codling worm is very prevalent in the fruit in the Niagara District, and is becoming a serious matter with our orchardists. The fruit growers have been generally faithful in searching after the tent caterpillar, and partly for that reason, and partly from ordinary causes, there have not lately been many of them. They are hand-picked off early in the spring, or if the eggs appear in little rings on the ends of the twigs they may be cut off with a pair of shears attached to a pole. Later on when they hatch out they can be destroyed before they get to be any size. They form a "tent" around them (hence the name) and it is thus easily detected, and by persistently looking after our orchards, we have succeeded in keeping them nearly clear of the insects; and if anybody tells me his orchard is overrun with the common tent caterpillar I say it is his own fault. The forest tent caterpillar does not trouble us. I have seen it in the neighbourhood of London and St. Thomas. Our orchardists have not yet learned a way of fighting the codlin moth. It is so small, and does its work so secretly that it is not found out until the apples are ruined. I don't know of any one who has adopted a persistent course to get rid of it. There have been attempts, to a limited extent, to trap the larvæ by bandages. I am satisfied from experiments by myself and others that they can be trapped by placing bands of paper or woollen cloth around the tree; into these the larvæ will go to change to the chrysalis state. The bands should be examined every week or ten days. I have been told that by placing shingles, fastened together in pairs, so close that they almost touch each other about the tree, that the insects may be caught, as they will creep between them in search of a hiding place. Some people accomplish the same object by putting bits of rag at the foot of the tree on the ground. By some or all of these means I believe their numbers could be greatly reduced, if there was a combined effort by orchardists to do it. The presence of the codlin worm is a serious detriment to the sale of the fruit. Any person putting up apples for Europe will find that a single apple containing codlin larvæ will spoil the sale of the barrel in which it is found. Fruit which is sent to the European market requires to be perfect, and no apple is perfect with that moth in it. There are two insects, other than these I have named, which injure the foliage of the trees. One is a little web-weaving worm, called the fall web worm. It is not very abundant, though sometimes trees are injured considerably by it. Then we have the red humped caterpillar, it usually destroys only the foliage of one limb unless the tree gets very well supplied with them. A moderate sized tree may have the leaves all eaten off by them. It, however, is not a serious pest. The tent caterpillar and the codlin moth are the insects from which we suffer most.

Cultivation of Orchards.

While trees are growing, and before they have obtained their full size, I think it is best to cultivate the ground under the trees and keep it loose. This cultivation should continue until the tree has attained mature size, which will perhaps be on an average five or six years. After that the orchard may be safely seeded down. If there is to be any value obtained from the grass by grazing, it would [illegible] to

[*Mr. Beadle.*]

be broken up occasionally and reseeded, but I don't know that I should attempt to do it. I think I should let the grass take care of itself. In cultivating the ground before seeding it down I should plant it with potatoes, beans, beets, or hoed crops of any kind. I have grown Indian corn in an orchard, but I took good care to have food enough for the trees and for the corn too. I am strongly of opinion that sowing of any grain crops such as oats, barley, wheat or rye is especially detrimental to a young orchard. I have seen young orchards of two years' planting ruined by a crop of rye, because the rye absorbed the moisture which the trees required, and they literally died of drought.

Apples as "Feed."—Cider Vinegar.

To Mr. Brown.—I have known no one use apples to feed farm stock, but I have known some men turn their pigs into the orchard to eat up the apples. Very little apple cider is made in our district beyond what each family makes for its own use or to make vinegar. Sometimes they boil it to flavour fruit. For this reason no attention has been paid to the question of what apples are the best for cider making purposes. If I were going to plant an orchard for cider, so far as my idea of quality of cider is concerned, I should prefer the Siberian Crab family of trees.

Longevity of Apple Trees.

To Mr. Aylsworth.—Q. What do you consider the average longevity of our standard apple trees in Ontario in both drained and undrained soil? A. In soil that is wet or cold, which is probably what you mean by undrained soil, I think the average life of an orchard might be placed at fifteen years; in good soil properly cared for I hardly know, but it is fifty years at least.

To Mr. Dymond.—The Siberian Crab is a prolific tree, and goes early into bearing after it is removed from the nursery—about four years—it would be profitable at five or six years. I have had no experience of the quality of the vinegar that is made from that source, and have not sufficient knowledge of the matter to enable me to say whether the cultivation of these trees would be profitable as a means of manufacturing vinegar on a large scale.

Q. Do you know whether our climate and soil would be favourable to the production of those apples which are used for the manufacture of cider in England? A. So far as the Niagara district is concerned I do not know of any variety that would not grow there; but I have not gone into any examination of the question of the growth of cider-making apples. The only knowledge I have of the question is with regard to some parts of the State of New Jersey, where they grow apples to make cider which is sent to New York to be manufactured into champagne. I have tasted champagne avowedly made from that source. I have reason to believe that orchardists find the manufacture of this cider profitable. I cannot recall the name of the apple from which it is made. It is one of the smaller varieties of apple often spoken of as a crab, but it is not any of the crabs that we cultivate here. My impression is that the apples, such as we grow for market here, are very poor cider apples.

Limits of Apple Culture.

Though there is no part of the area of which we have been speaking—that is the Province of Ontario as far north as Lake Nipissing—in which I believe some variety of apple could not be cultivated, yet there are some portions of the Province in which certain varieties cannot be cultivated successfully. We are gradually getting hold of the apples which can be grown at the north with success. The Duchess of Oldenburg will grow where any apple will grow, and as far north as this Province extends. It is one of the varieties which I would recommend settlers in the northern part of the Province to try. Ben Davis will not grow as far north as the Duchess of Oldenburg, but will thrive a good way north, but in the coldest sections of the Province I would recommend the Duchess of

Oldenburg, the Wealthy, the Peewaukee, and possibly the Mann Apple. The Duchess of Oldenburg is a fall apple; the Wealthy is a winter apple, and so is the Peewaukee. So far as we have got the varieties it would be chiefly the fall apples which I would recommend for that climate. The Red Astrachan will grow well up towards the limit we have been speaking of. The Tetofsky is a tart apple, a long way behind the Duchess of Oldenburg, and in no way more hardy. If I were going to plant trees for cider I would plant the Tetofsky, as it abounds in juice. My sources of information lead me to believe that the failure of the Snow Apple of which I spoke is general and not local. I think there are districts more favourable than ours for the cultivation of the Snow Apple. I should expect it to grow well along the St. Lawrence river, and along the shores of Lake Huron. Anywhere in the limestone soils it has a better flavour, and is less likely to spot. It has been grown largely in our most easterly counties in past years, but I don't think it is grown so much now. Apart from its spotting I should say that the Counties of Glengarry and Stormont would be particularly favourable to its growth. We have not yet been able to trace the source of the spotting.

Q. Would manure have any effect upon it? A. Mr. Ault, one of the Directors of the Fruit Growers' Association, in a communication in *The Horticulturist*, says that he has taken excellent care of his orchard, and yet the fruit was spotted so badly that he was disgusted, especially as one of his neighbours who took no care of his, had a fine crop of perfect fruit.

Export Trade in Apples.

Quite a number of persons in our district have shipped apples to England, and some to Scotland. Mr. Robert Ball sends his entire crop to Scotland. He ships his to a consignee in Glasgow. In some parts of England the Canadian apple is distinguished from the American. I have seen the results of comparisons of prices, and in some instances they were decidedly in favour of our apples, though in some cases the Americans take the lead. There is a variety of apple which can be grown on the Hudson River, called the Green Newtown Pippin, which commands a better price in England than any other American or Canadian apple.

To the Chairman.—When it is ripe and well grown it is of a beautiful golden colour. As a rule, my remark about red apples being the best for the English market, is true. The Newtown Pippin has been sent from the Hudson to England for many years. Mr. Pell, the owner of one of the orchards, sends his whole crop to England. He packs them with the greatest care, rolling each apple in tissue paper, and putting them in small sized packages. He has succeeded in getting up a reputation for his apples.

To Mr. Dymond.—I think the extreme care which is taken in packing the apples has a good deal to do with the price. I don't think there is any reason in the apple itself that it should be preferred by the epicure. There are other apples which, in my opinion, are equally as good. I don't know of any one in Canada who is taking special care or making special effort with regard to opening up a trade with England. There are portions of the States of New York and Michigan which are equally favourable with Ontario to the growth of apples suitable for the English market, but with the exception of those areas I think ours is the best apple growing country. There is no reason whatever why Canada should be second as an apple growing country to any country I am acquainted with. We have better apples than they have in England or can possibly grow there. I would give the preference to Canada in comparison with England as an apple growing country, having regard also to the cost of raising. There is nothing to prevent our apples from competing successfully with the English apples in England, if they are properly sent. We have beaten them in their own market with the Ribstone Pippin. It sells in England at £3 sterling, or $15 a barrel. I could not give the cost of shipping a barrel of Ribstone Pippins to England. That variety is not very largely grown on this side of the Atlantic. I am not aware that it has gone out of favour either here or in England. In order to have it sent there in season it must be shipped by steamer. The apples should be gathered not later than the first of October—usually not later than the first of September, as it should be in the market not later than the middle of October. It is still

popular in England, and there is no reason why it should not be grown here as freely as in England. It is possible that if it were not so scarce as it is, the price would come down. The blight which I spoke of as attacking the ends of the shoots, as an epidemic, is not a new trouble, as I remember it appearing in my earlier days. I am not able to trace it to climatic or atmospheric causes, though I am suspicious that atmospheric causes have something to do with it. I have sought for the cause, but could not find it. I don't remember that there was anything peculiar in the way of meteoric phenomena that year in which it was so prevalent. I have no idea that in Canada these insect pests, such as the codlin moth, the caterpillars, etc., are more troublesome than in other countries; the codlin moth itself originated in Europe. When I spoke of the sale of a whole barrel of apples being damaged by the presence of one apple affected by the moth, I did not mean that that one insect injured any of the other apples, but simply that it caused a prejudice against the fruit.

Tile Drains Preferred.

To Mr. Brown.—I would recommend tile draining for an orchard when draining is necessary, but I should prefer to get a piece of ground that did not require it. There is, of course, some danger of the stoppage of the drains after some years. I have tested them more with grape vines, and I have found that they will choke up the tiles even when they were six feet down. I should expect the same of apple trees, though they do not seek the water like elm or willow trees. I should say that a large mass of stones at the bottom of the drain, if properly laid, would answer the purpose, and would be safer than tiles. The convenience in laying tile drains is greater than in laying stones, and they are less expensive.

The Commission adjourned until 2.30 p.m.

Upon resuming, D. W. Beadle was recalled.

Comparison of Varieties of Apples.

To the Chairman.—The Keswick Codlin is valuable chiefly as a cooking apple. The Early Harvest and Red Astrachan are valuable for dessert, but are good for cooking also. The Benoni is a variety which is much esteemed for dessert, but is not worth much for cooking. The Sweet Bough is the best of the sweet apples, and it is good for dessert to those who like a sweet apple. Of the fall apples the Gravenstein stands head and shoulders above all other apples for dessert. The Twenty Ounce (Cayuga Redstreak) is largely used by our people in towns for cooking. The Duchess of Oldenburg is also a good cooking apple. Some use it for dessert, though it is a little tart. Some years ago the Fall Pippin was very popular as a cooking apple, but its popularity has fallen away of late years, as it is subject to the spotting of which I spoke with regard to the Snow apples. Taking the Province as a whole, I class the Snow Apple as a winter apple. In our section of the country it is a very early winter apple, and does not keep much beyond Christmas. I presume that further north it is found to keep pretty well on into spring. Of the winter sorts, the Rhode Island Greening is, on the whole for the country generally, the best cooking apple for home consumption and the local markets. My personal preference is in favour of the Esopus Spitzenberg, as the best of all the winter varieties. Above all the rest of that season for a dessert apple I place the Swayzie Pomme Grise. For early winter, Norton's Melon is a good dessert apple, but it is not very abundant. The Northern Spy and the Esopus Spitzenberg are also good dessert apples. The Baldwin is used for both cooking and dessert, and the Golden Russet for dessert only, but they are both a long way behind the Spitzenberg and Swayzie Pomme Grise. It is one thing to cater to the public and quite another thing to satisfy private tastes. The public buy their apples by their eye. They go into a market and an apple that looks showy will sell well even if it is only of second or third quality.

[*Mr. Beadle.*]

Care in Packing Necessary.

Great care should be exercised in packing apples for the foreign market, and unless that care is taken the result is almost always loss. A great many have shipped from our section of the country to the foreign market and have reported to me that the speculation was a loss, but when I came to inquire I found that there was a very good reason—they were not packed and selected with care. In the first place you should pick out prime apples, all well grown specimens. When I say well grown I do not mean extra size by any means, but that they are the fully developed size of that variety. Then they must be free from imperfections, such as cuts or bruises, spots or scabs. They must be packed carefully, not handled roughly, but put into the barrel with care, gently shaken when the barrel is full, and when the top is put on they should be pressed a little. I have seen some apples piled up and the top pressed down so that the cider ran out; that may do for the home market, but for the foreign market there must only be a little pressure. If you want to send an extra sample and get an extra price, you must wrap each apple in tissue paper, and line your barrels at bottom and sides with coloured tissue paper, press them down a little and, perhaps, instead of rounding the top up with apples, put in a quantity of some soft material. Some recommend packing with buck-wheat chaff, but anything will do that will keep the apples from shaking when the barrels are moved about. Apples put up in that way command a much higher price that will pay well for the trouble.

New Varieties.

To Mr. Dymond.—I speak rather as an apple tree grower than as an orchardist. I have not attempted to raise any new sorts from the seed. The art of raising new sorts has made considerable progress in Canada. There are several apples of Canadian origin which may be said to have attained some celebrity in the market—the Swayzie Pomme Grise and the St. Lawrence. It is a matter of dispute whether the Fameuse is a Canadian apple. My opinion is that it is. There are other apples of Canadian origin which have not attained much celebrity. Mr. Charles Arnold has devoted more attention to the raising of new sorts than any other person in Canada.

Pear Culture—Variety of Pears.

To the Chairman.—Pears can be as successfully cultivated in the Niagara District as anywhere else in America. The pear succeeds best in a clay soil. It is not so particular with regard to the sub-soil as the apple is I have seen pear trees growing in soil which was a clay loam with the stiffest kind of blue clay sub-soil, and they seemed to thrive to the highest degree of perfection. Of course it was not a cold sub-soil, though a very stiff clay. Perhaps about one-half the standard pear trees in our district are bearing trees. With regard to the age at which standard pear trees begin to bear, there is even a greater variation in the pear tree than the apple. A few varieties begin to bear early, but perhaps the average age would be about three years later than apple trees—beginning with about seven or eight years from the time of planting. The Bartlett and some other varieties fruit early. Since the introduction of the dwarf pears we have managed to get some other varieties to fruit early. Of the summer varieties the Rostiezer is a small early pear, but a good one of its size. Next to that I should place Osband's Summer pear. The Beurre Giffard is another summer pear of a very good quality, and I would place it perhaps side by side with the Osband's in point of flavour. Coming late in the summer or early in autumn, the Tyson is superior in quality to any I have named. I am now speaking of summer pears for home use, for our own tables. There is another pear called the Windsor Belle, much larger than any of these I have named, and about as large as the average Bartlett. It is a very profitable pear to grow for market, but one that I never want to eat myself. It will realize more money in the market than any other of its season. I don't grow it in my nursery because I think the public should be educated to

buy something better. I find that the Bloodgood makes a very good summer market pear. It bears liberally with us and seems to be a very healthy tree, not entirely free from blight, yet much more so than either of those other kinds I have named, and I think if I were planting early summer pears I would plant it largely. It sells well, has a golden appearance when it is ripe, frequently with little russet upon it, and it is sweet and rich. Our summer pears are used almost exclusively for dessert and not for cooking purposes. Next in season would be perhaps Clapp's Favourite. It is an early autumn pear, and will prove as valuable for this country as any I know of. It is about the size of the Bartlett. The tree is hardy and productive. By hardy I mean able to endure the extreme cold of our climate. It is a seedling of the Flemish Beauty, but even more hardy than its parent, and a larger fruit. If allowed to hang on the tree too long it becomes decayed at the core, but you cannot perceive it until you break open the fruit. Next to it in point of time in ripening is the Bartlett, which has a great reputation as a market fruit. I suppose more barrels of pears of that variety are sold in our markets than any other. It has brought, until within the last year or two, $10 a barrel, but of late it has been reduced down to about $6, partly owing to the stringency of the times, and partly to the increased supply. That variety has been planted largely in the State of New York, and Canada as well, so far as pears have been planted in Canada at all. Following the Bartlett, I suppose the next best variety would be the Beurre d'Anjou; that variety will last into November, and sells at a very good price; in fact it has sold at fabulous prices. I have been told that barrels of it have been sold for $30 in the Boston markets and I presume it would readily bring $15 now. There is another variety that will last a little longer than that, and is very popular as a market fruit in Western New York. It could possibly be grown as profitably in this section. I refer to the Duchesse d'Angouleme; it is a remarkably healthy tree and as nearly free from blight as any variety we have. I have seen quite a number of pear orchards ruined by the pear blight, but I have never seen one of that variety seriously affected. It is no uncommon thing for those pears to sell for 12½cts. a piece on the Philadelphia and New York markets. They are large sized, handsome pears, of fair flavour though not the highest quality of fruit. The Beurre Clairgeau is a good pear when fairly cultivated. In the hands of persons who are skilled in handling pears it would prove very profitable. It is a large sized pear of most beautiful appearance and colour, but it requires to be handled very differently from the way we handle fruit generally.

Gathering and Packing.

The fruit should be gathered just as it is about ripe and not allowed to hang too long on the tree. One rule is that when the stem separates readily from the tree the fruit should be picked and packed in boxes and then covered with an old carpet or woollen sheet or something of that kind to exclude the air. They should be kept in a cool place until they are wanted for use; if they are then brought into a warmer room they will ripen into a most excellent quality of fruit. The pears I have named are the most profitable varieties that I am acquainted with. I have not spoken of the Flemish Beauty, which is a very desirable pear for home use, but it is not profitable, especially as nine people out of every ten do not handle it properly; it is generally shipped to market too ripe and the result is that the consignee sends back only a long bill of charges.

Amateur Varieties.

For amateur or home use the Sheldon is a pear of the highest quality, though it is quite a sufferer from the pear blight. It belongs to the somewhat acidulated varieties, but is one of our finest dessert fruits. The Belle Lucrative is a sweet, rich pear, but it is not a favourite of mine as there are so many imperfect specimens, unless it has a certain amount of sunlight and exposure. The Beurre Bosc is a pear which is much esteemed where it can be grown. It can be grown in our district, but it is a delicate tree, and will not bear our average Canadian climate. It sells well on the market, but I don't think it would be a profitable orchard tree for market purposes. If treated in the manner I described with regard to the Beurre Clair-

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geau it will ripen up in a surprising manner. I have not spoken of the White Doyenne, which sells well where it is grown, and is a first-class variety. It is, however, so subject to disease, that I do not recommend anybody to cultivate it. The Gray Doyenne is not so subject to the same difficulty, but it has a feeble tree. The Beurre Hardy is a good dessert fruit for the fall, for the average Canadian climate. It has a tree of more than usual vigour of constitution and hardiness, and the fruit, in pomological parlance, ranks "very good." Our Fruit Growers' Association are endeavouring to have it more thoroughly tested throughout the Province. The Beurre Superfin is not of so high a quality as the Beurre Hardy; it ranks as "good." I don't think the Buffum would succeed in Canada as a profitable market sort. It will succeed on sandy soil better than most other varieties, but there is not much money in it as a market pear. So far as my experience enables me to speak, our winter pears are not worth much. The varieties for early winter do very well, but those varieties that we can keep over to spring are not very well flavoured fruit. I would sooner have some of the apples I have named than any of the pears after the middle of January. Up to that time I think the Lawrence would stand first in my selection. In a well drained, warm clay soil the Beurre d'Aremberg would be a good pear to plant, and the amateur will enjoy it very much. The Beurre Diel is a well-known pear. On clay soil it is of good quality, but on sandy soil it is almost worthless, because it has no flavour. The Beurre Easter is the best of the very late pears which I have tried. The Josephine de Malines ripens about the middle of January if kept in a cool place, and is a pear of very fine quality, though it does not bear to any extent until it is about twelve years old. The Vicar is one of the most variable pears I have had any experience with. Once in a long time you will get a crop that is really good, but probably for a number of years after you will have nothing eatable. However, my experience has been largely in sandy soil, and I think that in a warm clay soil, with great care in thinning out, better results might be obtained. The fruit should be allowed to develop to its natural dimensions.

Most Profitable Varieties.

So far as I know the Bartlett is the most profitable pear we have; next is the Duchesse d'Angouleme; third the Beurre d'Anjou, and fourth the Lawrence. There are some varieties of pear trees which will not grow on the quince at all.

Quince and Pear Stocks.

In some varieties I would give the preference to those grown on the quince, over those which are grown as standards. If I were planting an orchard of the Duchesse d'Angouleme, I would plant them on the quince root. It grows well, and comes into full bearing three to five years sooner than the standard. If it overloads it can be thinned out so that the fruit will be perfect. If I were planting the Bartlett I would sooner have it on the pear stock, so that one cannot give a categorical answer as to which is the better plan. Taking pear culture as a whole, I would sooner plant on the pear stock, especially taking into account the present knowledge of the art. The pear crops of our district are chiefly consumed at home, though a small quantity is shipped. The average price has been about $8 a barrel.

The Blight—The Pear Slug.

The blight is the great drawback to pear culture. Remedies for it have not been tried with any success. The most that has been tried is the incorporation of iron filings, charcoal, etc., in the soil as a manure. When I was quite a lad my father thought that iron filings and charcoal were a specific against the blight, but he lived long enough to give up that idea, for he found that the blight would come and kill the trees upon which these remedies were tried. The trees are not materially affected by borers in the trunks or limbs. The insect which is most destructive of the leaves is the pear slug, a small

creature resembling a slug, which eats off the green portions of the leaves and leaves them skeletons. It is easily overcome by sprinkling the trees with ashes, or even with dry dust.

Picking the Fruit.

The blanketing process is necessary with some varieties of pears, but not with all. The best time to gather them is when they separate readily from the tree. If, when you put your hand under the fruit and lift it up, the stem separates readily from the tree, it is ready to gather, but the practised eye will know it by the colour of the fruit, as there is a little change. I think most of our varieties don't require the blanketing process. The fruit should just be put into tight boxes or barrels; I prefer half barrels for pears. In the full-size barrel the weight of the fruit presses upon the lower tiers too much. When shipping for market they must be shipped hard enough to reach their destination before becoming soft. I suppose most cultivators have now got past that difficulty in shipping the Bartlett. The Bartlett should be picked before it separates readily from the tree. It may be gathered when about two-thirds grown, and even then it will ripen up in the barrel with a fair flavour, and become altogether a nice fruit, though I prefer it at full size.

American Blight.

To Mr. Dymond.—Pear culture in America is attended with difficulties which are not experienced in the Channel Islands. We have a disease here known in Europe as the American Blight, we call it the Fire Blight. The term has been so long used by fruit culturists that we know what we mean by it, but after all the word only expresses our ignorance, for we don't know what it is nor what causes it. It usually makes its appearance in July, and from that on to the end of the summer. It sometimes first appears in the end shoot of a summer's growth. They are noticed to become black, and they dry up. Sometimes this blight will only extend to the growth of the present season; at other times it will take two or three years' growth; occasionally it will appear on the trunk of the tree, and when it does it is usually death to the whole tree. The pear is cultivated throughout the State of New York. It is cultivated in Virginia, Pennsylvania, Ohio, and Michigan. It is not so much cultivated in Delaware and the Southern Atlantic States. The peach in those States takes its place because the climate and soil are so well adapted to its cultivation. There is a disease which appears on the quince and Siberian Crab so analogous to the one I have described that it seems to be one and the same disease. The disease is not wholly unknown in England and the Channel Islands, because they speak of it there as the American blight, yet I presume it is seen there only to a limited extent. The liability to this blight seriously impairs the whole of America as a pear growing country. We are not particularly liable to it as a disease in Canada. My impression is that it has not appeared in the Channel Islands sufficiently to make it a source of serious trouble. As to districts near the sea, I am not sufficiently acquainted with them to give a decided opinion; but I should say that where the climate is such that pear trees can be grown they would not be so likely to be troubled with the blight as we are, because I know that in the vicinity of Boston there is a small section of country nearly or quite exempt from it. The climate of that section is more humid than ours, that is about the only difference.

Use of Meteorological Observations.

I have not paid sufficient attention, in a scientific sense, to the effect of rain fall or atmospheric changes upon fruit growing in this country to establish any scientific results. I think the introduction of a system of careful meteorological observations in connection with fruit growing would be very desirable. A knowledge of atmospheric phenomena circulated amongst fruit growers would materially assist them in their vocation, as to the adoption of particular kinds of fruits and the mode of treatment at particular periods, but to what extent it would prove valuable it is hard for me to say. In the hands of thinking fruit growers it might be of material benefit.

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Limits of Pear Culture.

The classes of fruit which we grow here, pears, peaches, etc., are similar to those grown in England, and some are identical. Nearly all of the English pears grow here. I should think that not over one-half of Ontario would be favourable to profitable pear culture. As to the geographical limit I should take a belt along the northern shore of Lake Ontario and the River St. Lawrence, of uncertain width to me, but well known to those who live in those localities. When you get back from the river I think pear trees could not be grown at a profit, for this reason that although there might be a good crop raised some years, there would be many years in which they would suffer so much from the cold that the crop would be comparatively small, too small to compete with the more favourable districts. On the Georgian Bay there are modifying influences which ought to make it a good pear growing country, the severity of the winter's cold being tempered by the lake. With the exception of the blight I have spoken of, pears are not a more uncertain crop than apples. As a rule pear trees yield an annual crop; they are not so uniformly biennial as apples. Some varieties of apples yield only in alternate years. I do not know anything of Canadian pears having been sent to England. I think our pear crop is fully consumed in the Province. Pear culture may be said to be comparatively in its infancy; it is far behind apple culture. Owing to the pear blight—which is the sole serious difficulty with the fruit—its culture is not as profitable as that of the apple. Efforts have been made to discover the cause of the pear blight. These efforts have been made largely under the direction of Mr. Meehan, of Philadelphia, and Mr. Saunders, of Washington. The latter has made up his mind that it is of fungous origin. I don't think anything has been done by the Government to ascertain its cause. We don't look to the Government at the present time to interfere directly in matters of this kind. Anything in the way of united effort has been made by our Association, and the only thing the Government has done in the way of aiding in the cultivation of fruit has been to give a grant to the Association.

Plum Culture—The Curculio.

To the Chairman.—Plum culture has not been profitably pursued in our district, but I know of no reason why it should not be. The reason why it has not been profitable is that plum growers have been contented to let the insects destroy the fruit without taking any pains to combat the evil. But a person planting an orchard of plum trees, and taking care to destroy the curculios, could grow an abundant crop, and get very remunerative prices. Many people have been deterred from growing plums extensively on account of the curculio. They are a scarce article in our market most years. Clay soils are best adapted to their growth, but some varieties will thrive in sand. I don't know that we have been growing plums enough in our section to enable me to tell you what varieties are esteemed. Head and shoulders in point of quality above all plums of good size stands the Jefferson. It is one of the highest, if not the highest flavoured kind of plum. It ranks side by side with the Green Gage, which has almost gone out of cultivation in this country for two reasons: The first is, that the fruit is so small, and the second, that the trees grow so wretchedly that no nurseryman can afford to grow it for the price that is obtained for the trees. An ordinary plum tree will be fit for sale in from two to three years from the bud, but the Green Gage will not grow in less than five years, and then it is a scraggy little thing. The Peach Plum is an excellent fruit, and among the earlier plums the Yellow Gage might be named. The McLaughlin is a plum of fine quality—of finer quality than the Yellow Gage, though the latter ripens first. The Bradshaw is a large, fine showy plum, but not equal in quality to those I have named. It would be sought for if brought into the market. Smith's Orleans is a very productive variety. The Lombard is probably the most productive of all varieties. The Lombard would be the most profitable to grow for market in our section. Generally speaking the darker-coloured plums are the most profitable for market. I think what we call the common blue plum will come as near to the Lombard in point of profit as any. Though it will

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not sell at so high a price per bushel as some of the finer plums, yet the yield is so great that it more than compensates for the difference. It is sometimes called the Damson plum, but nurserymen would think if the Damson was ordered that the English plum of that name was meant, but it is another variety. The English variety is an acid plum and has green flesh, while the other is not so acid, and has orange-coloured flesh. There are no plums exported from our district except to a very limited extent, and their exportation is merely a matter of accident. The usual price realized for plums is from $2 to $3 per bushel. The curculio is very troublesome. The plum has no other serious trouble. Of recent years it has not suffered much from black knot. Delicate skinned varieties suffer from the rot, but thick-skinned varieties are less subject to it. We have in our section of country a variety of plum, probably a seedling of the Damson class of plums, which I think will be valuable partly on account of its immense cropping qualities, and partly because the fruit seems to be exempt from the rot. Even the curculio does not thin it more than enough to benefit the crop. I don't think that it has any name at present. It originated in the neighbourhood of Jordan, and I have suggested to Mr. Moyer of that place that he should cultivate it more. There is reason to believe it is a seedling, because sprouts from the parent tree invariably yield the same fruit. I am not aware that anybody has propagated it by graft or bud. There are no birds that seriously injure the ripened plums in our district. I have used salt as a fertilizer for plum trees, but not with sufficient results to give the Commission any information. I know it is the general opinion that salt is a valuable fertilizer for plum trees, but that is all I can say about it.

To Mr. Dymond.—I have not observed whether the pear blight is less prevalent in a damp than a dry season, but it is possible that careful observation would prove that it is. I should expect so from the fact that in the neighbourhood of Boston, where they have fogs two-thirds of the year—coming down at night and enveloping the whole country—the trees do not suffer to any extent from the blight. I am inclined to think that the humid state of the atmosphere has something to do with it.

How to Destroy the Curculio.

The only remedy for the curculio in the plum is to catch and kill the insect. This could be done if the people were all industrious enough to do it, for the process is quite familiar to nurserymen and fruit growers. The simplest contrivance which I could recommend, and it is within the reach of everybody, is to get a few yards of cotton cloth and two strips of lath, to which each end of the cloth is to be fastened. A pair of these sheets should be laid on the ground at the foot of the tree, just at the season of the year when the blossoms have fallen and the fruit is beginning to appear from the calyx. The tree should be suddenly jarred, and the insects will drop upon the cloth. This should be done every morning before the heat of the day, as the creatures do not fly then, but in the middle of the day they are on the wing, and you will not accomplish your end. There are two ways of jarring the trees so as not to injure the trunk; either saw off a small limb about one inch in diameter, leaving the stump a few inches long, and strike on the end of that; or, you may bore a small hole with a bit, insert a round rod of iron and leave it there to strike upon. Shaking the tree will not bring the insects down, as they seem to think that that is merely the wind swaying the tree; but suddenly jarring the tree seems to impress them with fear—they curl their feet up and drop immediately to the ground. They look like a dry bud as they lie curled up. The sheet can be carried by the slats, and the insects should be emptied into a vessel of water which should be at hand. You can then destroy them at your leisure. This process should be continued at least once a day until you find the numbers so reduced that you can safely let it go for two or three days. It is usual to continue the operation about three weeks. I don't think that even in that time the plum has arrived at such a state of maturity that it can defy the curculio, but the object of the insect is to lay the eggs, and of course the season for laying the eggs is past in that time. The insect makes a little puncture with its proboscis and lays its egg in this cavity, the egg hatches out and the young

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curculio larva makes its way to the centre of the plum, causing a premature dropping of the fruit, which is what it wants, because it desires to drop to the earth before it passes into the pupa state. It is believed that the perfect insect feeds upon the plum to some extent, but the amount of damage done in that way is slight. The damage is in the propagation of the species.

Method of Pruning Fruit Trees.

To Mr. Brown.—I like to prune an apple tree into a sort of inverted umbrella shape as nearly as may be, having some reference of course to the habits of the tree. Sometimes however I make a second storey of limbs—a small set in the centre. I don't think, however, that the form is so very essential so long as we keep the top sufficiently thinned out to allow a free circulation of air, and enough of the sun's warmth to come to the leaves. We should guard against allowing the tree to become too dense, so that the fruit is not sufficiently exposed to the sun-light and air—perhaps mostly the air, because I believe the fruit needs but little sunlight. The leaves are the organs that develop the sap both for the fruit and the tree. We should also guard against exposing the bare horizontal branches to the direct rays of the sun, because sometimes the heat is sufficient to scald the bark when so exposed. The only object I have in pruning an orchard tree is to get a circulation of the air and let in the light. The cup form of tree is probably not so important here as in Great Britain. In Britain the sky is overcast much more in summer than with us, and there is proportionately less sunlight.

Peach Culture.—Varieties.

To the Chairman.—The peach tree can be profitably cultivated in our district; the trees stand the winter perfectly well. The fruit buds are occasionally injured by a low temperature. Some of the newer varieties of peach will ripen very early. One of them is a native of our section, and is called the Early Canada. It originated at Jordan, a very few miles from St. Catharines. I believe it to be a seedling of Hale's Early. It came up in a fence corner along with a number of others, and there was a great similarity in the fruit of several of the trees, and the time of ripening was very close together. This one was, however, one of the earliest to ripen, one of the finest in flavour, and decidedly the best in size. The Waterloo is another new variety which ripens very early. The Alexander is another. It has been longer known than the Waterloo. Amsden's Peach, or Amsden's June, as it is sometimes called—though it does not ripen with us in June—is an early fruit and so is the Wilder. These early varieties are very much alike; the flesh of them all more or less cling to the stone. They partake of the character of Hale's Early, which was at one time the earliest we had, but they are earlier than Hale's and of better quality. I don't think the introduction of the early peaches will stimulate peach culture in our section of the country. It will enable the peach-grower to have a longer season of marketing, but I don't think it will extend the area or acreage. It is possible that in some sections of the Province, particulary up near the margin of Georgian Bay, the season may be too short to ripen some varieties of peaches. I think the Early Crawford is the most profitable peach yet known. The local demand in our district is not sufficient to consume the crop. The surplus is shipped to Toronto, Guelph, Goderich, Berlin, Waterloo, Galt, Kingston, Ottawa, Montreal, and other places. I cannot give you any idea of the quantities that are shipped from that section of the country. The largest peach orchards are in the neighbourhood of Grimsby.

The Yellows—Insect Pests—Soil.

The disease called the yellows is known in the district. There is no remedy, but to dig up the tree and burn it. The fruit does not suffer from the curculio. I don't think the trees suffer from the borer, but if they do it is altogether owing to the negligence of the owners. A mound of ashes or even earth put round the collar of the tree before the frost is out of the ground in the spring, and allowed to remain

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until late in the summer will exclude them perfectly. I would not allow it to remain all summer, but would take it away after the season of laying the eggs has arrived—about end of July say. I think the moths are more abundant during the month of July. The peach tree is sometimes troubled with the little leaf roller, but so far as I have had any experience it does but very slight injury. The peach thrives best on a warm, light soil. It will not thrive on a heavy clay or damp soil.

Seedling Varieties of the Peach.

The most promnient seedling peach in our locality is the Early Canada. It is a white fleshed peach. As yet I have but a limited knowledge of its hardiness in other sections of the country; but I am persuaded that seedling peaches raised in our country will be hardier than the average of foreign varieties—in other words, that if our people will take the pains to raise seedling trees they will gradually get a race of peaches that will be hardier than trees from southern countries. There is a gentleman in Beamsville, Mr. Kilborne, who has planted quite a number of seedlings, mostly of the Crawford type. I went and examined his orchard, and found he had a number of very fine peaches—all of them, or nearly all of them, yellow fleshed peaches, and I think amongst those there will probably be found some worthy of propagation. I take this for granted: that if you select the seed of a tree that is growing as near its northern limit as may be, and, if it perfect its seed, plant that seed, and you will gradually grow a race of trees hardier than the parent. I demonstrated that in the case of Chinese arbor vitæ. My father imported a tree years ago; he succeeded in getting it to live by protecting it; now it has borne fruit and seeded, and I have raised young trees from its seed that are perfectly hardy.

Apricots and Nectarines.

Apricots and nectarines are cultivated in our district to a very limited extent. Both these fruits are subject to the curculio, and that is the reason they have been neglected. The trees fruit regularly. I think the apricot is in a measure hardier than the peach; the blossom buds will stand a lower degree of temperature without being killed. The number of varieties grown is very limited. The Early Golden and the Breda are about the only ones. Some seedlings have been raised, but no names have been given to them. The fruit of these seedlings is beginning to be brought into market quite freely, and I am inclined to believe that if the same care were taken with apricots as has been devoted to other fruits we might raise a race that would do well. The foliage of the apricot is pecuiarly free from insect depredations.

Peach Growing in Canada Profitable.

To Mr. Dymond.—I regard certain parts of Canada as particularly favourable to the growth of peaches, both in soil and in climate. The limits of peach culture may be said to be the peninsula between the lakes, the northern shore of Lake Erie, and a small district on the south shore of the Georgian Bay. Various attempts have been made to cultivate it elsewhere, and for a time the tree will live and thrive, but the severity of the winter usually kills the fruit buds. The natural home of the peach is Northern Persia, where the climate is very like our own, sharp cold winters—though the thermometer does not go down to 30° below zero—and quick warm summers. Within the limited area I have mentioned we can compete in peach growing with the United States. We get peaches imported from New York, New Jersey and Delaware earlier than our own, but as soon as ours come in they take the market owing to the less cost of transportation. I don't think there is any material difference between the quality of the same varieties in Canada and the United States. If anything, some of ours have a higher flavour than the same varieties grown there; but, on the other hand, they have some varieties that grow better and have a better flavour than here, for the reason that their season is longer, and

they can mature them better than we can. I regard peach growing in Canada, within the area I have mentioned, as a profitable industry.

Cherry Culture—Uncertain Condition of the Fruit.

To the Chairman.—I am inclined to think that the cultivation of cherries has not been a profitable industry in our district, though the fruit can be grown. The price realized is not remunerative when all the contingencies are taken into account. It is a very difficult fruit to handle. You may pick cherries to-day, send them to market in apparently good condition, and by the time they reach their destination one-half of them may have decayed spots in them—enough to destroy their value for market. Then again the orchardist may look at a cherry tree to-day and find the fruit in beautiful condition. He concludes to pick them to-morrow, but when to-morrow comes he will probably find that one-half of them have these spots, owing to some atmospheric change. This is particularly true of our larger and more showy cherries. We had some cherries at the table to-day, and they seemed to have come to market without these changes, but the reason was that they were picked before they were half ripe. They should have been as black as ink if they had been ripe, but these were merely red or half red. If you pick cherries in that condition you can get them to market, but who wants to buy them or eat them? These remarks do not apply so much to the Duke and Morello cherries, but there is a good deal of what I have said applies to them. The common red cherry, which is so abundant over almost the whole cherry region, is less liable to this decay than any other variety I know of. I am not very familiar with the English Morello. When you come to such varieties as the May Duke and the Reine Hortense they rot to some extent, but not so badly as some others.

Varieties of Cherries.

Of the tart cherries the one that succeeds best is the common red Kentish cherry. It can be grown wherever any cherry will grow; it is always an abundant bearer, and it is an excellent variety for cooking purposes, and all purposes for which cooking cherries are used. It is a great deal better for those purposes than our sweet cherries. The English Morello, I believe, is another of that same class—a hardy tree and an abundant bearer. It is very acid and makes a good cooking cherry. Then there are the Early Richmond and the Montmorency, but I should say that there is a good deal of confusion, among fruit growers even, as to the names of these same cherries. The class of cherries which are known as the Morellos and Dukes are all acid cherries, and are all more hardy than the sweet cherries, and can be grown throughout the fruit area of Canada generally. They are the most profitable to cultivate in some sections. The Heart cherries and the Bigarreaus I have no faith in as profitable market fruit—they are so subject to rot. Of the Bigarreaus I think the Napoleon succeeds best in our district, taking everything into account. In point of delicacy of flesh and flavour I think the Governor Wood is the best. It is the finest we have, and is very early. Next I would place Tradescant's Black Heart or Elkhorn, which is a large sweet cherry which ripens later. The Black Tartarian is another fine showy cherry of the Heart class, which everybody likes. The home market consumes all the cherries we raise. They are sold at about eight cents a quart. The Morellos and Dukes are the best market sorts, and they carry the best by far. They should be packed in small packages with the stems on—the packages should be the same as those in which strawberries are packed, and they should be put up in cases the same as strawberries.

Insects—Slugs—Birds.

Some years the curculio is very troublesome—not so much so to the acid cherries as to the more delicate varieties. There is a sort of slug which affects the leaves to some extent, but it can be combatted in the same manner as the pear slug. The cherry is

subject to the caterpillar as much as the apple tree is. The little cedar or cherry bird is the bird most destructive to the fruit. The robin takes a certain quantity, but he does not compare with the cherry bird in his depredations. The latter come in flocks of fifty or sixty, and sit down on the trees and stay until they eat up all the fruit.

Suitable Soils.

I have not found the cherry tree very particular as to soil. The Dukes and Morellos succeed well in almost any soil—clay or gravel. The Hearts and Bigarreaus are not so well pleased with a clay soil—they prefer a lighter soil, but that preference is overcome by working them on the Mahaleb stock. Nearly all the seedlings grown in our district are good. I have not found any difference in the hardiness of trees grown upon the Mahaleb and Mazzard stocks, but there is a great difference in their adaptability to soils. The Mazzards do not thrive so well on clay soils. Peaches grow best on peach stock, and there is nothing gained by working them on plum stock in our climate.

The Cedar Bird.

To Mr. Dymond.—I don't think the cedar bird is protected from destruction by legislation. I am not aware that as an insectivorous bird it does anything to counterbalance the mischief it does to fruit. I think they feed their young on cherries or fruit of some kind. They feed freely on the berries of the red cedar, which ripen in the autumn and last all winter. Its young are usually on the wing about the time the cherry crop is gone, in the month of July. I don't think they raise more than one brood in the year.

Quince Culture.

To the Chairman.—Quinces are grown in our district, and all varieties succeed well. The most common variety is the Orange Quince, which is thought to be the best. The trees bear regular crops. The demand for the fruit is fully equal to the supply. It realizes about $2 a bushel.

To Mr. Dymond.—Only a small quantity of the fruit is grown. I think there is some increase in the demand, as I see that some quinces are imported into our market from the United States. My impression is that they are largely used for flavouring. The quince is subject to the twig blight, of which I spoke with regard to the apple.

To the Hon. Mr. Wood.—I believe the quince can be made a profitable fruit. The average yield of a quince tree is about half a bushel. They are not planted over six feet apart. They are long-lived trees, but are slow in coming to maturity, and I am inclined to think that that is the reason we have not given them a fair chance. They are generally stuck in amongst the fence corners, but I believe if they were properly cultivated and taken care of they would attain their full growth and begin to bear much earlier than they do now. From conversation with one or two gentlemen who had made some experiments, I should judge that the quince tree will respond to generous treatment as much as any other tree we have.

Grape Culture—Varieties.

Grapes are very generally cultivated in our district, but not to a large extent by any one person. Any variety that will ripen in our climate will succeed well. Perhaps the Concord is the variety which will give the largest return with very little attention and labour, but of course the price is not high—I suppose about five cents a pound. There is a variety of grape known by us as the Champion; it is known also by the name of the Tallman. At least I believe them to be the same grape, though that is disputed.

[*Mr. Beadle.*]

It is a very early ripening grape; it ripens with us in August, and on that account it sells readily and is a profitable grape. When I spoke of five cents a pound I meant that that was the retail price in our market. The grower does not get more than three or four cents.

To the Chairman.—I presume that during the grape season you could go into our stores and get the Concord for five cents, but if you got a dozen pounds, you might get them for four cents per pound. Next to the Champion comes the Hartford Prolific, which is very profitable, because it is early. Next to it in time of ripening comes the Concord, which seems to carry the day, it is so easily supplied in large quantities. It generally brings down the price of grapes, even of those which are larger, finer, and more highly flavoured. The Champion and the Beaconsfield are the same kind. Those three varieties are at present, I believe, the most profitable grapes. The White Grape, which proves to be hardy and productive, when it comes into market will be the next most profitable. The Martha has not filled the bill so far. It does very fairly, but for some reason which I cannot tell, it does not rank very high. Grapes like a warm, porous soil abounding in lime. A good many of our surplus grapes are shipped to Toronto, and, I think, to Montreal. The Champion will sell for about 15 cents per pound, just because it is so early. Grape culture I consider a profitable industry. Concord Grapes at four cents a pound will yield more money per acre than most other varieties. The grape sometimes suffers from late spring or early autumn frosts. Two years ago we had a frost in May, and we thought it had ruined the entire crop, but the vines threw out a second growth, the fruit ripened, and we had a fine crop. There are a lot of dormant buds in the grape, and if one set gets killed, the second set will push out and the fruit will mature if the season be long enough. We have not been troubled with any injury to the fruits or leaves of the vine.

Mildew—Insect Enemies—Birds.

Perhaps, however, I should qualify that answer. There are some varieties—none of those I have mentioned—which are subject to mildew, a disease affecting the leaf. Many attempts have been made to plant the European grapes in Canada. The vines will grow for a while, sometimes they will bear a crop or two, but in the end they will all succumb to the mildew. During the winter I received an inquiry emanating from the Commissioner of Agriculture about some parties abroad bringing in and planting European grapes, and I replied it was utterly useless; that the experiment had been tried and had proved a failure, and that it always would prove a failure. There are a few varieties of our own—the results of hybridization—that are more or less subject to this disease. Occasionally we see some mildew upon the Delaware, but not often. There are no insect enemies that prove serious. The little steel-blue beetle *Haltica Chalybea*, eats out the bud just when it is bursting. He eats the grape, of course, but I find that by watchfulness it can be kept in subjection. The larvæ are well known, having been described in our horticultural works and reports. Occasionally there are a few *Sphingidæ* and similar caterpillars that feed on the vines, but they are not numerous. We are troubled a good deal with birds. I am not just certain what kind of a bird it is, but there is some little sharp-billed bird—I used to think it was the wren, but they are not numerous enough to produce the mischief—which sticks its bill into the grape, and then passes on to the next and treats it in the same way. The robin generally swallows the berry and is done with it. One of my neighbours has a pretty large vineyard of Concords, and I remember one year the robins came by hundreds and nearly ruined his whole crop. He has not been so troubled with them since, and last year the crop was as abundant as ever. We have several other varieties of the thrush, but I don't think they do much damage. In the case I spoke of in which the robins did so much damage, there were woods near by. Almost all of our sparrows frequent shade trees and orchards, where they come early and find hiding places. The little bird which I mentioned as being so destructive to the grape is, I think, either a wren or one of the chirping birds of the sparrow family.

[*Mr. Beadle.*]

The Phylloxera.

To Mr. Dymond.—Unfortunately in Europe they have imported an American insect that is laying waste the vineyards there with terrible destruction, the grape louse or phylloxera. It is believed by naturalists that it has two forms, one feeding on the leaves and the other on the roots, I have seen the leaf form on my own grounds but not for several years. In some parts of the United States this insect has been prevalent and vineyards have suffered from them. In some parts of California it has been a serious detriment. There are some varieties of our native grapes which are thought to be proof against it. When I say that it has two forms I mean that it attacks the leaves and the roots at different stages of its growth.

To the Chairman.—I think it is thought by Professor Reilly that the form that feeds on the leaf is never complete—that the egg laying form of the creature is never produced from the leaf louse but comes from the root louse.

To Mr. Dymond.—I don't think the injury to the vine is serious so far as they affect the leaf, it is only when they attack the root that the vineyard is destroyed. We do not suffer to any appreciable extent in Canada from the insect which I spoke of as having been imported into Europe from America, but I believe they do in some parts of California.

Wine Grapes.

To the Hon. Mr. Wood.—I have not given any consideration to the cultivation of a grape for the manufacture of wine, though there is something in that way done in our district. The grapes I have mentioned are table grapes not wine grapes. The grape most profitable for wine so far is chiefly the Clinton with some admixture of others. I cannot say that the wine grapes are hardier than others. The Clinton belongs to another class of grapes, both are American, but botanists place them in two distinct classes. The Clinton grapes are juicy, acid, but not very palatable for table purposes, these qualities tending perhaps to make them valuable for wine purposes. The table grapes I have referred to are all out-door grapes. They are not laid down and covered in winter in our district; it is a very great advantage not to have to cover them up.

The Grape Indigenous.

To Mr. Dymond.—Our grapes are all indigenous to this continent—they are native grapes. They have been raised by horticulturists by sowing the seed of native grapes. Those I have mentioned, the Champion, the Concord, and the Hartford Prolific have all been raised from seeds grown in this country, from native grapes. There are others, such as the Massasoit, which are a cross between the Fox grape and the foreign grape. The other grapes I have mentioned are descendants of what is known as the Fox grape. The Clinton is quite distinct in its habits and character. I have been told by a gentleman in Muskoka that they cannot find the wild grape there at all. The cultivation of the hardy sorts of grape can be carried on in almost all parts of Canada. The consumption of grapes at present is almost entirely for table purposes. My impression is that we are just in the infancy of grape culture; we have not yet attained complete success with either table or wine grapes. The best kind of grapes for wine-making are the Clinton and its derivatives.

Method of Cultivation.

To Mr. Brown.—I have no particular mode of cultivation besides the ordinary modes; I have nothing occult in my methods. I think the usual distance apart at which vines are planted in the rows is about twelve feet, and the rows of vines about sixteen feet apart. I don't know that I can tell you the average product per plant, but I should think that twenty or twenty-five pounds of grapes per vine is about the average, when they are planted so closely. I should think that if the product was much beyond that there would be danger of impairing the strength of the vine.

[*Mr. Beadle.*]

To Mr. Dymond.—In Canada we grow the vines either trained to a pole or trellised. In California they do as in France—grow them to a stump. I don't see any particular advantage in the latter mode. The vine grown in France is an entirely different kind of grape from ours, and I am inclined to think they are more readily grown in that form. I think they naturally grow more stocky and tree-like than ours. In California it is foreign grapes—which can be grown there with success—that are grown in that way. They are not subject to mildew there, but it is amongst those vines that the phylloxera is working so much havoc in California.

Amateur Varieties of Grapes.

To the Chairman.—For amateur growth I would take the Delaware. I should also like to grow some of the Creveling. It requires to be grown with some care. It should be planted where it will get abundance of pollen from other varieties. The grape is of fine quality and ripens early. I also like the Massasoit for an early variety. The Wilder is another, a black grape. The Agawam is a favourite of mine, because of its peculiar musky flavour. It comes the nearest to the Muscat of any of our grapes. We cannot usually ripen the Catawba here. I know of a large number of seedling grapes that are not in general cultivation, and some of them promise to be good. There is one known as Moore's Early, which was originated by John B. Moore, of Concord, Massachusetts, from seed of the Concord grape. It promises to be a valuable early grape. How hardy it will prove can only be known when it has been tried. There are two or three white grapes which promise to be of value. One is called the 'Prentiss, another the Niagara, another the Duchess, and another the Pocklington. They are all candidates for popular favour. As to preparing the ground for planting the grape, I would do it as for a field of corn—have it in good heart and see that it is well drained.

Fertilizers.

To Mr. Brown.—I have little faith in special fertilizers. Grapes should be fed very little with the rank manures; bone-dust is better. If manures are used they should be well decayed. Bone-dust is an excellent fertilizer for fruits of any kind, and especially small fruits.

To Mr. Dymond.—I don't think the exportation of our grapes to foreign countries has been attempted. I doubt if the Concord grapes, if they could be exported, could compete with the European grapes. It is possible that we could export them with our quick steam transit.

Raspberry Culture.

To the Chairman.—We have no great difficulty in our district in growing any of the varieties of raspberries. The Antwerp class suffer a good deal from the cold of our winters, or rather from the extremes of our climate. I don't think I would make any special difference between the varieties for amateur culture and those for general purposes. Sometimes the leaves are covered on the under side with a yellow powder, and after a time the whole bush dies. I don't think it is caused by an insect, but by a fungus, similar to the rust on grain. It affects blackberries occasionally. When I discover that the plants are affected by it I pull them out root and branch. I believe the fungus will spread from one plant to another when it finds conditions suited to its growth, but that it will not generate rapidly upon strong, healthy plants, but upon those that have already been weakened from some other cause. The plant is long-lived in comparison with the strawberrry, if properly treated, but I think after six or eight years it should be ploughed up. I don't think that raspberries should be planted again, but that some other crop should intervene before the land is again cropped with raspberries.

[*Mr. Beadle.*]

Varieties of Raspberry.

The Antwerp suffers sometimes, but the Clark raspberry is a good variety in point of colour, flavour, size, and market qualities. It is also very productive. The Philadelphia is more productive than the Clark, but its colour is not so popular. It is about as firm as the Clark, and will carry to a near market very well. It is immensely productive. The quality is not of the highest but it is very fair—I am, of course, still speaking of the red berries. There is another variety, the Highland Hardy, which comes in amongst the earliest of the red raspberries; it ripens about as soon as the strawberries are done, and is desirable as a link between them and the raspberries. Its qualities in other respects are medium. Brinckle's Orange is one of the more tender of the Antwerp class; it is yellow in colour with an orange cast. There is a French variety, the Hornet, which is a large, handsome berry of good flavour, though it is a little tender. The Philadelphia, Highland Hardy, Brandywine and Clark are the hardiest in my experience. The Franconia is another red variety, which has been cultivated a good deal for market, and is of very good quality. It ranks between the Hornet and the Clark. Ten cents per quart is the price usually realized for raspberries. I know of no insect which seriously injures the crop or the plant. Some insects feed upon the leaves, but they have not been so numerous as to be very troublesome.

To Mr. Dymond.—I have named one variety, the Hornet, that is an imported sort, still I believe they are all descendants of the Antwerp family. I look upon them as illustrations of the remark I have made that while the parents may be tender, the seedlings will gradually become valuable by adapting themselves to conditions of soil, climate and surroundings. I remember that in my childhood the Yellow Antwerp was frequently killed in the winter, but these varieties that are descendants of the Antwerp are becoming sufficiently hardy to stand our climate. There are three or four varieties of the Black Caps. The Doolittle Black Cap is a good berry and very productive when properly cared for. If a person is growing plants and fruit at the same time he may make a failure of the fruit though he may succeed with the plants. They grow by the tops reaching over and taking root in the ground, and this seriously affects the fruit producing qualities of the plants, but if a person will persistently prevent them from taking root by pinching off the tops the crop of fruit will be large and juicy, and will be also comparatively profitable. The Davison's Thornless is the earliest of the Black Caps, the berry is about equal to the Doolittle in size and productiveness and has the advantages of ripening early and being thornless. It is quite as hardy as the Doolittle. Then there is the Mammoth Cluster which has a very thorny plant. It is a more vigorous grower than the Doolittle and has a larger berry, though it is not perhaps a more vigorous cropper. It ripens decidedly later than any of the others. It is hardy, showy, has been widely disseminated, and is as profitable as any. There is a new competitor in the field called the Gregg, but I cannot speak of it otherwise than by hearsay. Experiments have been made, I think with success, with a view of crossing the Antwerp and the Black Cap varieties, but how profitable those results will be I cannot say. The cross brings out a peculiar maroon colour which is not in much favour in the market.

Blackberries.

To the Chairman.—Blackberries have not been much cultivated with us for market, or even in private gardens, though a few persons have grown them. The first berry which attracted special attention was the New Rochelle or Lawton, but it has largely gone out of favour. When it is allowed to ripen it is a very palatable fruit, but the plant being tender and the fruit very acid in its earlier stages, it is little cultivated at present. In its place has come the Kitlatinny, which is very nearly as large a berry as the New Rochelle. Then there is the Snyder, which is believed to be quite hardy—much more so than the others I have named, but the berry is smaller and the crop less. Blackberries find their way into market in small quantities, at about ten cents per quart. I know of no insects that materially injure them.

[*Mr. Beadle.*]

Currants.

Of red currants, the most popular with us just now is the Red Cherry Currant There is a variety called La Versailles, which I have grown alongside the Red Cherry Currant. I can see no difference between them, but some say there is. The best white currant is the White Grape. It is larger than the White Dutch, fully as prolific, and its appearance is in every way better. The black currant most esteemed is the Black Naples. The Black English is not so large. There is another competitor, Lee's Prolific, which is not so large a berry, but may prove to be more prolific. The drawback with the Black Naples is, that it is not as productive as the varieties of red and white currants. What we require is a black currant that will compare with them in that respect. The culture of currants is very limited in our section of the country, but I think that those who do grow currants get good prices. The reason that its culture is so limited is that attention has not been given to it, though the prevalence of the currant-worm has had some effect. The currant-worm is easily mastered with a little hellebore. I don't think we ship any currants, but they are bought up at home, at about eight or ten cents a quart. The proper distance apart to plant currant bushes is about four feet each way. Black currants will prefer a little more room, perhaps six feet, as they grow larger bushes than the others. Any soil which will produce good corn or potatoes is suitable for the growth of currants, but of course the better the soil the better will be the crop. The currant borer has not been serious with us. The saw fly has been very troublesome to us, and a serious drawback to currant culture. Farmers and cultivators almost gave up in despair, but there has grown up a class of men who look to fruit culture as a business, and they have planted currants, and by systematically caring for them they are keeping insects down with good results. My remarks with regard to soil, apply to black currants as well as to red and white.

To Mr. Dymond.—There is no part of Canada where currant culture is carried on to any great extent, or which I would recommend as being especially adapted to their growth. Practically we can grow them anywhere within the limits we have been speaking of. I don't think we have any worse enemies to contend against in currant culture here than in any other country.

The Commission then adjourned until 7.30 p.m.

Friday, June 11th, 1880.

The Commission met at 9 o'clock a.m.

D. W. Beadle was recalled and examined.

Insectivorous Birds.

To the Chairman.—I don't know of any bird that feeds on the codlin worm. I have sometimes thought that the hairy or downy woodpecker was searching after the larvæ, but I cannot be sure. The fly-catcher tribe, I presume, feed wholly on insects but the robin does not; the blackbirds, I think, feed mostly on insects though they may eat some grain. The woodpeckers do most in the way of devouring borers. I have sometimes thought that those small birds like the chickadee seem to be seeking for the eggs of insects, but I have no positive evidence upon the point. The robin is sometimes very injurious to grapes; when they come in large flocks they will sometimes ruin a small vineyard. The depredations of the woodpecker are not very serious; the meadow lark feed chiefly on insects I think, but the cat-bird eats fruit as well as insects. We have been importing a bird which I think will yet prove to be a great pest—that is the English sparrow. I know of no bird that injures the buds of fruit trees so much as it. I think the oriole occasionally feeds on the blossoms of fruit trees. The birds most destructive to fruits are the cedar bird, the robin and the woodpecker. I doubt if the English sparrow eats insects

at all. They are always hunting for grain, and in the early spring they look for the buds of gooseberries and currants. It is possible that our climate may be too severe for them to multiply very much.

To Mr. Dymond.—I am not very clear as to the advantages that may be derived from the existence of the birds I have named, compared with the disadvantages they entail upon the fruit grower. When we speak of insectivorous birds we must remember that they destroy not only insects which are injurious to the farmer or to the fruit grower, but also those which benefit him. There are insects which are of more benefit to us than all the birds put together. I should say that our Acts of Parliament for the protection of insectivorous birds generally and indiscriminately may be doing as much harm as good. There are no birds that I know of that confine themselves to the destruction of insects that are prejudicial. That, however, can only be ascertained by the careful examination of stomachs of many of them, and I have never made a careful examination.

Gooseberry Culture.

To the Chairman.—My impression is that there has not enough been done in our district, in the way of growing gooseberries, to settle the question of whether they are profitable or not. There are two varieties which are being planted now. The Downing and Smith's Improved, which latter is very like the Downing. They are grown because they are found to be practically exempt from mildew. I have seen a little mildew on the Downing, but not enough to do any harm, and it does not occur perhaps more than once in five years. Both varieties are very prolific, though the berries are much smaller than the English gooseberries. I don't recommend the English gooseberries for profit in this climate, because they mildew both in leaves and fruit. There are a few localities where they are practically exempt from mildew, but only a few. I hardly know how the exemption arises. Sometimes I think it is owing to the humidity of the atmosphere, and I am inclined to believe that that is the case, though there may be other influences. I have found that by freely sprinkling a strong solution of salt under the bushes, the humidity is kept up, and the mildew avoided to some extent. About ten cents per quart is the price realized for gooseberries, and they sell readily both green and ripe. Those who grow for the market generally wait until the berry is near its full size. The currant worm must be guarded against by a free use of hellebore early in the season. The insects come just about the time the fruit is beginning to set, and if hellebore is applied promptly and freely it is a perfect cure. I have never known any injury result to man or beast by using hellebore upon plants in this way. It would have to be used in large quantities to produce any serious effect upon the human system. I have not found the fruit-worm that feeds upon the berries in our district. For gooseberries I prefer a rich clay loam, bordering on clay. If I were planting extensively for market I would put the bushes in rows six feet apart, the plants being about four feet apart in the row. For ordinary garden purposes I would plant them four feet apart each way.

Varieties of Gooseberry.—Mildew.

To Mr. Brown.—For immediate use, and apart from the trouble of producing them the English gooseberries are preferable, because they have a higher and richer flavour than the varieties I have named. I look upon gooseberry culture in this country as being in its infancy. Up to within a short period we have been trying the English varieties and seedlings of the English varieties, and they have been attacked by mildew. Our attention was therefore directed to the American varieties, and the two varieties I have named have been the result so far; but I believe that by persistent efforts in this direction we will in time get varieties which will rival the English gooseberries in size, and will not be subject to mildew. I know nothing to hinder the growth of the gooseberry in Ontario within the limits of which we have been speaking. I have never heard that the frost injured the fruit buds. It is possible we will never get a gooseberry with so thin a skin as those in England, because our climate is much hotter and colder. The peculiarly cool and moist atmosphere of Great Britain is favourable to thinness of the skin.

[*Mr. Beadle.*]

To Mr. Dymond.—There is no difference I think in the opinion of botanists between English and American gooseberries, but there is a difference in their adaptability to our climate. The American gooseberry is a native of this country, it is found growing wild. Those gooseberries that have succeeded here, so far, have been developments of the indigenous plant. The amount of salt in the atmosphere of Great Britain—owing to its insular position—helps to keep up the humid state of the atmosphere. I know that in Nova Scotia and New Brunswick, within a certain distance of the sea, there is a belt in which the English gooseberry can be raised in perfection. The portions of Canada, where they have been cultivated with success, have been very limited. They have always been nearest the shores of lakes or rivers so far as I know. So far as my knowledge goes attempts to grow the gooseberry inland have been failures. The wild gooseberry grows in dry situations. Practically then the gooseberry of America is one that ought to be cultivatable in every part of the continent. Very little has been done as yet in the way of gooseberry culture. Our Association distributed a plant of the Downing gooseberry to each member for trial, owing to its exemption from mildew; we have reports of results to a limited extent. We have failed in the way of getting results of observations, and our members have been contented to enjoy what they received and keep the knowledge to themselves too much.

Cranberry Culture.

To the Chairman.—Cranberries are not cultivated in our district, but grow wild in great abundance. I could not give you any idea of the average yield per acre. There is a ready sale for all that is grown, and for all that is imported. The section of country known as the Dunville Marshes is largely covered with wild cranberries. I have no means of knowing the quantity collected. Some years of course the crop is large and other years it is small. There is ready sale at high prices in all our towns and cities. They run from sixteen to twenty cents per quart. There is a caterpillar which injures the vines. It is not always present, but when it does come it is a very serious enemy to the cranberry. It seems something like the army worm and other migratory insects; it comes and goes. I believe that cranberry cultivation would be a success in this country, under favourable circumstances.

To Mr. Byrne.—We always find them growing in marshes. They will not grow in dry land.

To Mr. Dymond.—If they were cultivated it would be very desirable to be able to flood them with water. I have tried them thoroughly in ordinary garden soil, but they will not thrive there; they might be cultivated in localities suited to their growth, but they need not be tried anywhere else. When cranberry culture comes to be discussed in this country it will be found that those localities that contain a head of water at the control of the person owning the plantation, so that it can be flooded at pleasure, will have a great advantage over any other. When this worm comes along and threatens to destroy the crop he can be drowned by submerging the whole plantation, for a few days, and thus got rid of. You can also protect them in that way from frost, either late or early. The flooding does them no harm, but on the contrary does them good, if you don't keep them under water too long.

Forest Trees.

There is a very small proportion of our section of country under original forest; there are little patches on almost every farm left for firewood, but they are gradually disappearing, and the land is becoming almost denuded of forest—no attempt is being made to encourage a second growth. The great aim of our people has been to get the forests off our country and keep them off. All the trees that have been already mentioned are common in our section of country. In the swampy places there are larches. The willow is not abundant, except along our water courses. There is a considerable quantity of oak, and elm is common. Ash is abundant, both white and black, and

[*Mr. Beadle.*]

hickory is found, but it is very sparse. Walnut and butternut are both quite abundant; there is not so much cherry, though there are occasional trees to be found. Maple and beech are very common; there has been white pine, but there is very little now, occasionally there is a plantation of second growth grown by accident.

The Tulip Tree.

We have also the whitewood tree, which is used by carriage-makers in making the bodies of carriages. The most of that tree grows in the Niagara District. There are beautiful trees of it in our district, many of them being nearly as large in diameter at the top where the branches come out as at the bottom; some of them must be fully forty feet high. I think it is one of our most handsome ornamental trees and I have often wondered why planters of ornamental plantations have paid so little attention to it. It makes a very symmetrical tree on a lawn, and about this time of the year it comes out in tulip blossoms which have a pleasant fragrance. The leaves are remarkably bright and green, and free from insects. Though it is difficult to transplant the tree, if you begin young you can accustom it to transplantation. The root is very unlike most of our forest tree roots, it is a very fleshy root, more like that of a vegetable.

Economical Woods.

The oak is put to a variety of uses, perhaps more than anything else to the making of barrel staves. Elm is used for the heads of barrels and for the hubs of waggons. Ash is used for a variety of purposes, such as for making bent stuff for tools, agricultural implements, hay fork handles, etc. Hickory is sought after for axe helves, and for handles of tools such as hammers. Walnut is sought after for cabinet work largely, and as the supply has decreased the price of the wood has been materially enhanced. The butternut is used to some extent for cabinet purposes, but not so much as walnut. It is stained more than the walnut. I think there is very little walnut shipped from our section, it is mainly consumed at home. The railroads use a good deal of wood for ties, and the various manufacturing establishments of our country consume a large proportion of our woods. There has been very little of these woods used in our buildings for internal fittings. There are a few residences in our towns in which the chestnut, black walnut and butternut have been used to some extent in interior finishing, leaving the wood in its natural colour. I think the tastes of the community are growing in that direction. When building my own house I found I could obtain chestnut and ash wood as cheap as, or cheaper than first-class pine, and I used them. I think they are much more handsome than painted wood-work. My impression is that ash is most generally used in making agricultural implements, though I have not taken any pains to inquire. Our paper manufacturers are using a variety of poplar chiefly for making paper-pulp, and likewise basswood to some extent. I expect that before long they will have the poplar pretty well used up, and then the basswood will likely take its place. Distribution of the poplar with us is not large. At present it is commanding, prepared for their use, about $4 per cord. They don't take any very small limbs, but sticks of wood of pretty fair size, exempt from knots, and as buyers have to select just such pieces as they want they have to give a higher price for it. That wood for fuel or any purpose except the manufacture of paper would not be worth $2 a cord, in fact few men would buy it at all. Years ago they used to make a great deal of charcoal, using for it the chestnut chiefly. There has not been much done in charcoal making for the last fifteen years, but I presume occasionally it is burnt, as blacksmiths use it. It has, however, largely gone out of use. I think oak is largely used for railway ties. Black walnut grows in the rich black soil bordering upon clay, with a clay sub-soil usually. We find them more abundant in limestone soils than in others, though they are not confined to such soils. Possibly the reason why we find them there is that along the ledge of what we call the mountain—the table land running from Niagara to Hamilton—the wood has not been cut off so completely as elsewhere; we find the native black walnut there. The walnut is easily transplanted if handled properly in its youth. When walnut trees are about four or five years old they

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should be transplanted into the open, but they should be transplanted once before and then there will be no difficulty with them. It is a rapid grower, but I cannot say at what age it would be merchantable. I look upon it as a tree which would not be merchantable when it is small. The uses to which I have seen it applied required it to be a foot in diameter to be really valuable. There is no attention at all paid to the systematic thinning, with a view to preservation of old or new forest trees.

Re-planting the Forests.

I would recommend for forest planting, the hard maple, particularly as a tree which will be very valuable yet in our country. The black walnut is in great demand now, and will continue to be in demand. I am now of course speaking with reference to the economic uses of these woods. I believe that plantations of white pine will eventually pay, when our timber regions to the north have become used up, or burnt up. The white pine grows rapidly. The chestnut may also prove to be a valuable wood, though I would not say so with any degree of certainty. If the tastes of the people continue to go in the direction of having their houses finished in hardwood, it will be sought after, owing to the beauty of its grain, and its being easily worked. The ash will always be valuable, particularly white ash. Some samples of it are as beautifully grained as chestnut. Bird's eye maple is a very handsome wood, and makes a beautiful finish for cabinet work. I don't know about the oak whether it is going to pay or not. We are not so destitute of oak yet as to bring the question up in the near future. I don't know of any European trees that we ought to import on account of their wood. I have not the slightest doubt that plantations of hickory will pay in the near future. One of the greatest pests we have in our country is the axe-helve hunter. When a hickory tree gets to be six inches in diameter he will offer the farmer so much for it that he is induced to sell it. For very poor land I think poplars, birches and pines would be the best. The plan best adapted to secure the planting of forest trees would be the dissemination of information going to shew that such plantations would be valuable. The governing principle in the commercial world is dollars and cents, and when you convince our farmers that they are going to make money by planting trees they will plant them. The experiment of planting trees on our hillsides has not been tried, but if the soil on these and other locations which cannot be readily cultivated is like that on most of our hillsides, any of the forest trees will grow readily upon it. If these hillsides were so planted the whole of our section of the country would be greatly enriched within the near future. The farms upon which the trees would be planted would be increased in value. It is possible that legislation might do something to encourage forest tree planting —perhaps by giving bonuses or something of that kind. No one in our neighbourhood has planted any young forest trees. For such planting I would begin with small trees, because they can be more safely transplanted when four or five feet high. Of course the distance apart would depend on the size and habit of the tree. Hickory trees might be planted quite close together, say three or four feet apart, with a view of thinning them out after they get as large around as a man's arm, because wood of that size would be valuable for many purposes. Black walnut would require to be planted farther apart, because they would be of no use until they were about as large around as a man's leg. Besides it is rather umbrageous in its style of growth, while the hickory is upright. I would cultivate plantations of that kind as thoroughly as I would a nursery of apple trees, keeping the ground mellow, and free from weeds to some extent, though perhaps not so carefully as apple trees.

Desirable Varieties of Trees—Cost.

As to the cost per acre of such forest planting, young black walnut trees can be bought of the nurserymen who have been growing them, at about $12.50 or $15 per hundred for trees about four feet high. Chestnuts could be bought at about the same figure. I know of no plantations where the hard maple could be bought at any figure. Nurserymen have confined themselves mostly to the horse chestnut and mountain ash for

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tree planting. There has been no large demand for the other varieties. If it were known to persons who are engaged in the business that there would be a demand for those trees, they would be prepared for it no doubt. Persons growing them on a large scale, and having a certain and steady demand, can grow them much cheaper than they could on a small scale and an uncertain demand. Nurserymen would gather the seeds when ripe, and would sow them immediately—the sowing should not be put off one hour. So far as my experience goes, the greatest success has been attained in that way. Small delicate seeds should be covered very lightly with earth, and should be protected from the scorching heat of the sun. The great danger is in putting these small seeds—such as the elm—too deep. The horse chestnut, black walnut and others of that kind require to be planted more deeply. As to whether they should be planted in drills or beds, I find it more convenient to keep them clean when they are planted in drills. The elm and silver maple ripen their seeds very early. Some ripen in September; others in October and November. I would plant the late ones just as soon as they were ripe—the same as the others. If from force of circumstances I required to keep them over, I would mix them with some sandy soil, so as to keep them damp through the winter. Most varieties can be taken up when a year old, and planted out again—some require to remain two or three years.

Necessity for Tree Planting.

The effect of leaving belts of wood as screens for farms is beneficial. I remember passing over a field a few years ago, after an open winter of some severity, and finding that the clover on that field—which was near the belt of trees—was all sound and fresh, while that which was more exposed was killed outright. So with the wheat. That which had felt the full force and sweep of the winds was ruined, while the strip which was near the belt of woods, a few rods in width, was perfectly safe. I think the benefit to an orchard is still greater by protecting the trees from the sweep of our extremely cold winter winds. When the country is denuded of its forests the wind sweeps over it as it does over the western prairies; and these frost-laden winds, with the thermometer near zero, are very trying to both animal and vegetable life.

Methods of Planting.

I think if I were planting merely for the sake of sheltering my orchard I would plant only evergreens, of two or three rows in width, and I know of no tree which is so cheaply obtained, and grows so rapidly and makes so complete a wind break, as the Norway spruce. It is grown by nurserymen both in Europe and America by millions. They can be bought from one to two feet high for $10 or $15 a hundred, and if taken younger can be bought for still less. The reason I prefer evergreens is that shelter is wanted much more in winter than in summer, and our deciduous trees are very little shelter in winter, and they do not benefit the evergreens if mixed with them; in fact in my opinion they interfere with their dense growth and beauteous appearance. They grow more rapidly than the evergreens, and are apt to overshadow them and injure their growth. I should certainly prefer not to mix them.

Q. That is, supposing they are planted very closely. But suppose you had plenty of space?—A. By planting thinly you could not have a screen to break the wind until after a long time. I would plant the evergreens about eight feet apart, and if they began to interfere it might be prudent to cut out a few, but I would not plant them more than eight feet apart to start with, and in a little time the branches in the bottom would begin to interlock; but if they are put far enough apart to prevent the shade of deciduous trees from interfering with them it would be a long time before you have a shelter. If I wanted to plant deciduous trees at all I would plant them either in front or behind, and keep them a good distance off, but I don't see the advantage even of that plan. To make such a screen effective I think a shelter belt of Norway spruce, planted about the time you plant your orchard, would be best, as it would protect your orchard just about the time the

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apple trees came into general bearing. For planting around fields and on public roads, in single rows for ornament, the hard maple is the favourite tree with me. I am not particularly partial to the silver leafed maple, though it is a most popular tree with most planters because it grows so rapidly. The hard maple is a more symmetrical tree, and the foliage is very clean and free from insect depredations. If the land is low and inclined to be wet I would plant our native elms. I know of nothing more beautiful as a shade or ornamental tree than a well-grown elm. In New England, and especially in the towns and villages, these trees were planted very early in the settlement of the country, and some of the streets are just arched over by these elms, and walking under them you can imagine you are in some arched Gothic cathedral, built many years ago, with the columns only left standing. They certainly make a most beautiful sight. I should say that the trees should be planted from twenty to thirty feet apart for that purpose. They need to be planted larger than for ordinary plantations, because of the dangers to which they are exposed, such as cattle, etc. I should have them ten or twelve feet high. As to the cost, the trees could be had for $20 per hundred. There would be about 176 trees to the mile, and this number would have to be doubled, as they are planted on both sides. The cost of the trees would be, say $75 a mile; the cost of planting would have to be added, and that is difficult to make out. Two men would plant 100 trees in a day very easily, or the whole of them in three and-a-half days, which would be about $10 for planting. Native trees can sometimes be economically and advantageously obtained from our forests. There are second growth maples and ashes which might be used, when the cost of transportation is not too much. If properly pruned—cutting off the top branches to correspond with the mutilation of the roots—they make very handsome trees; in fact they are sometimes taken up and planted as mere bare poles. I would not recommend elm for narrow streets; it would be too shady, and would be apt to make the ground wet and muddy, and keep the roofs of the houses damp all the time.

Ornamental Trees

For such places I would prefer a more erect tree, such as the maple or hickory. The horse chestnut makes a good tree for cities, being dense and compact in form, and giving a shade without spreading too far. The tulip tree is also a pretty tree for cities. I don't know how they would be at a greater age, but at twenty-five or thirty years they are a very handsome tree. I would plant about the same distance apart in towns that I would on roads. The horse chestnut makes a very suitable ornamental tree for the neighbourhood of dwellings; it is beautiful in blossom, foliage and form, and is never troubled with insects. The elm is sometimes infested with the small measuring worm, which eats off the leaves. The mountain ash and the tulip trees are also free from insects, with the exception that the borer sometimes attacks the former. There are varieties of foreign maples that are very pretty planted along with our forest maple—such for instance as the Norway maple. The Maiden's Hair tree, *Salisburia*, is very suitable for small lots; its foliage is peculiar; it looks like the leaves of the pine welded together and flattened out as if the tree were a connecting link between the pine and the large-leafed trees. The cut-leafed birch is a very pretty drooping tree. In its earlier growth it throws up a tall, erect trunk, thirty or forty feet high, and then the branches begin to droop and grow downwards in long tapering strings, which are very graceful, and the foliage is neatly cut and beautiful. Then there is a variety both of the birch and the beech, with very dark coloured leaves, which are very pretty trees. The leaves are purple, changing in autumn to a purplish green; they are both perfectly hardy. There is nothing to be said against our native birches or the European white birch, but when we can get the drooping birch there is no particular reason for getting the others unless as a matter of variety; it has all the beauties of the European birch and a great many more. The lindens make very pretty trees, but insects prey upon their foliage sadly sometimes. Apart from that both the European and the native lindens are beautiful trees. The cut-leafed alder does not grow as high as these, but it makes a very nice tree, and is perfectly

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hardy. Wherever our native sumach will grow the *Rhus Glabra Laciniata*, or fern-leaf sumach, will thrive. It is perfectly hardy, and is a very pretty tree; they are about the height of our native sumach, and have the same habit of growth—a tendency to sprawl about in their branches.

Evergreens—Shrubs.

There is quite a list of evergreens, each possessing a peculiar beauty of its own. The cheapest and most readily procured is the Norway spruce; next to that is perhaps the Austrian pine, the Scotch pine, and the Oriental spruce. I don't know whether Nordman's fir is going to prove successful or not—I am afraid it is tender, except where the peach tree will thrive. Then there are some of the Rocky Mountain pines which are giving good promise of being valuable; they seem to be perfectly hardy. I would plant our own native white pine amongst them; it is about as beautiful a tree as we have. The reason it is not planted with us is that it is so common, but where it is allowed to grow out in the open it makes a beautiful tree. Of the smaller growing varieties I would recommend the juniper tribe—the Irish and Swedish particularly; I prefer the Swedish, because it is hardier. There are varieties of the *Arbor Vitæ*, which have characteristics that make them interesting; there are some tipped with white, giving them a silvery appearance, and others—the golden ones—with yellow foliage. The box tree injures badly with us in the winter, but I should say that in Ottawa and other parts where the snow comes early in the fall and lies late in the spring, affording protection to the tree from the heavy frosts, it might be used for edgings, etc. We use as a substitute the dwarf *Arbor Vitæ*, such as Hovey's, the heath-leafed variety, Parson's *Arbor Vitæ*, all of which are valuable, though differing from each other in their style of growth. I have not tried the American yew to any extent; I have seen it growing after transplantation, and it thrives well. The *Mahonia Aqua-folia* suffers from our winters if it is not covered with snow. It is not killed, but the leaves are browned, and the beauty of it destroyed until new leaves come out to hide them. When it is protected by snow it does well and is a pretty tree. The *Retinisporas*, or Japan cypress, I have not had much experience with, though some trees of that variety seem to promise well. There is a large list of flowering shrubs valuable for our planters, some of them native. The Florida dogwood *(Cornus Florida)* is grown by some. It is a very pretty tree while the bloom lasts, and it lasts a good while; the foliage afterwards is very pretty. In the autumn the foliage turns into beautiful colours, in which scarlet and purple predominate, and the berries are also very pretty. The flowering thorns are beautiful trees, belonging to the hawthorn family. When the trees are covered with bloom the air is filled with fragrance. As to their hardiness, they do not suffer much with us, and if they suffer at all it is not from the cold but from the sun. I have seen the bark on the south side of the tree dried up, and I supposed it was from the action of the sun. I do not prune up my Thorns, but let the branches grow close to the ground, and the trunk being shaded by that means the tree grows finely. Then there are two or three varieties of the Japan quince—I prefer the scarlet flowered variety; there is also a pink-flowered variety, with blossoms something like the apple. Both of these varieties are very beautiful; they flower early, before the leaves come out, and are an interesting sight early in the season. After the flowers drop the leaves come out; they are a bright, glossy green, neat, clean, and free from insects. In autumn the trees are laden with golden fruit, which is pretty to the sight, but very acid. I don't know that it is of any use. The Slug does not trouble the leaf with us. Another class of flowering shrubs is the *Spiræas*; there is a great variety of them. The most prominent is the plum-leafed Spiræas; the flowers are double, pure white, and in the autumn the foliage becomes purple, scarlet and crimson. There are varieties of weeping elms, such as the Camperdown elm. They are made by grafting the Camperdown on the Scotch at standard height. There is also Young's weeping birch; you have to graft it at standard height, and then it will grow horizontally and downwards. I forgot to mention the Weigelas, which are perfectly hardy with us, and are very beautiful. Another advantage which some of them possess is that they bloom the second time;

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they blossom first in June, and then in August or September. In some sections of the country the *Althœa* makes a beautiful shrub. The *Deutzias* I also esteem very highly; some of them are very low shrubs, and can be used in the smallest city grounds; others are larger, and grow to the height of twelve feet. The *Deutzia Crenata* is very pretty. There are also varieties of the honeysuckles and clematis which are very beautiful, and make fine plants for climbing up pillars or verandahs. Some of the clematises die down in winter, but if they are cut down at the crown they will grow up again next spring and flower all summer long. They have been used in England for bedding purposes by pegging them down and letting them creep over the bed. There are two or three varieties of the *Lonicera Tartarica*, which are very pretty; they are very showy when in bloom, and are easily cultivated.

Encouragement of Tree Planting Necessary.

Nothing has been done in our district in the way of preserving our forests or planting forest trees on poor uncultivated land. Our municipalities offer no encouragement for such planting, and if you were to moot such a subject to them they would think you were wild. If I were purchasing a farm I would make a difference of at least 20 per cent. between one which was well supplied with tree shelter and one which was not, and I would make even a greater difference in favour of one in which trees were planted along the road side or about the buildings. I believe that if such planting as we have been speaking of attained such dimensions as to become a feature of our landscapes it would add to the value of farms far beyond their cost, and would tend to induce gentlemen of taste from Europe to settle amongst us. As it is now, very little is done to beautify our farms and make them attractive to good taste.

To Mr. Brown.—There is no demand for soft woods in our section for the purpose of making powder. There is a powder manufactory at Hamilton, but I don't know where they get their supply of wood.

Q. Practically, then, there is no demand for any trees under six inches in diameter and ten or twelve feet trunk? A. There would be a demand for certain kinds of trees of that size or even smaller—such as hickories, but not to a very large extent.

Q. To such an extent that it would be an encouragement to the Government to re-plant certain parts of the country? A. If they were planted to-day I am certain that in time there would be such a demand as amply to repay them. The material for axe handles and handles for agricultural tools is rapidly diminishing, and it is time steps were taken, by the Government if necessary, to supply such a demand. On the average the investment would begin to realize in fifteen or twenty years—possibly fifteen years would be nearer the average than twenty. In certain sections some varieties of wood would be wanted for hoops, and seedlings would answer admirably for that purpose. I suppose both ash and elm would be suitable for hoops. As a rule it is more difficult to transplant evergreens than deciduous tree, just because the foliage is always present in the evergreens, whereas you can plant the others when it is not. But by taking evergreens just in the beginning of the spring, before they start into growth, if the season is not exceptionally dry, they are easily transplanted. The secret of transplanting them successfully is to transplant them when they are quite young, then let them stand for two years, take them up and set them further apart, give them two years more and then transplant them again. If evergreens were transplanted four times before they came into the hands of the purchaser they would hardly meet with a death. But most men would sooner pay a few cents apiece for trees which have been transplanted once than pay a higher price for trees which have been frequently transplanted. Our people have not yet been educated into a knowledge of the difference as they have been in Europe. I don't know of any plantations of the European linden in this country to any extent; I know of some towns in the United States where they are growing very nicely as a shade tree. They are very easily transplanted and grown.

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METHODS OF CULTIVATION.

Q. You spoke of planting the poplar and pine on poor lands. How long, on the average, would it be before they would realize a profit? A. I cannot say. Of course on poor lands I would expect the growth to be slow. But if it was poor only because it was broken, and not readily arable, there might be sufficient strength of soil to make the trees valuable, say within fifteen or twenty years, but on very poor soils it would be a longer period. If I were planting hickory, or ash, or walnut, for the sake of the timber, I would not plant them in clumps but at regular intervals apart, at just such a distance apart as I should think would produce the best results according to the variety of the tree; then I should cultivate them with a horse cultivator up and down the rows, and keep the ground mellow and free from weeds, so as to promote their growth in early life, believing that their growth would be increased sufficiently to repay for all their cost. The growth would be much more rapid than if they were left to get sodded down with grass or weeds. The grass would choke the growth of the trees very materially in their early life. I am not aware of anyone collecting tree seeds as a business either for our own use or for exportation. In cultivating sheltered belts I would keep the trees pretty close together, even to their old age, the object being to break the wind.

Q. Take the area of this room—would you say that you would have more shelter when the trees have matured—say thirty to fifty feet high—if you had four or six trees, than if you had two well developed trees in the same area? A. If the trees are as you say, well developed, near enough together when matured to have the branches interlock, the shelter would be as perfect; but it would be different while the trees were attaining that size; you would have gaps through which the wind would sweep with nothing to break its force. I am speaking now of the shelter and not of the value of the trees afterwards.

Q. Would you expect the same growth of the lateral branches all along from babyhood upwards? A. No; they would be somewhat checked when they began to interlock with each other. But with regard to the Norway spruce, the interlocking of the branches with each other does not cause the death of the branches, as it does with some other trees. Take for instance our balsam firs, a common evergreen in this country, if they were planted so close together that the branches would interlock, the lower branches would all die in a few years. But I have seen hedges of Norway spruce, twenty years of age, which were a perfect pyramid, and so dense that the wind could hardly play through it at all.

Q. Would you recommend in any case—whatever the soil or the kind of tree—the use of manures of any sort for forest trees? A. I don't use manure because I don't think they need it, or would be materially benefited by its application. If you keep the ground mellow during its youth so that it gets a vigorous growth, the decaying leaves furnish sufficient congenial nutriment to the tree. I don't know sufficient of the effects of trees upon the rainfall to say anything of the qualities of different trees in that respect. I have not noticed that the tent caterpillar has a particular affection for the mountain ash. I don't remember that any of our woods are sought for by engravers for use in their art. I have not seen the box tree cultivated to a sufficient size to make it useful for the engraver. We are yet in the field of experiment with regard to shrubs for hedges. The honey locust has been used, and is still used a good deal. I have tried it, but I am not satisfied with it. Its habit of growth is too strong; it wants to be too large a tree. It might be kept down with a great deal of labour, but on that account it is too expensive. The Osage orange has been tried on the western and south-western prairies, and has been found to answer a very good purpose, but I don't think it would endure the climate of many parts of this country. It might do well in Essex, Kent, Norfolk and those counties, though even there, I doubt if it will prove a perfect success. My experience is that in some winters, spots in the hedge would die out, as I suppose, from the cold. I have thought of our native wild thorn, but I have never made any experiments with it myself, or seen it tried. Some experiments have been made with the hawthorn from England, and I have seen some samples of hedge made with it which looked very well. Unfortunately the samples which I have seen have been allowed to grow wild from neglect. I have seen the berberry tried to a limited extent, and have some reason to look favourably upon it. It does not grow very

large naturally. They throw out their shoots from the crown in the way of suckers, so that the plant is thickening all the time. It is thought that the rust of wheat is another form of the rust which appears on the berberry, and that its growth would promote the extension of that fungus. If that should prove to be the case, it would, of course, be a serious consideration. When I was speaking of the thorns, I had in my mind the native thorns of the country, which are low spreading trees; though the buckthorn has also been used. I have made some experiments with it, and I find it makes a pretty hedge, and is very tenacious of life. It is, however, not thorny enough to make a very safe fence. As to keeping out cattle, I find that when you get a hedge up to four or five feet high, cattle are not very apt to try whether it is thorny or not.

Q. Do you think it possible for the Government to mature a plan for the re-planting and conservation of the forests in the Province—looking to all interests—by getting command of certain parts of the Province for that purpose? A. I think it is quite possible. One of the first things the Government would need to do would be to satisfy the public that it was a judicious expenditure of public moneys, and disseminate information that would lead the public to a right understanding of the value of the work.

To Mr. Aylsworth.—If you plant the common pine young enough it will be no more difficult to get it to live than any other evergreen; but if you take trees from the woods it is difficult to transplant them if they are too large, but if people were content to begin with seedlings they would succeed without difficulty.

Second Growth Timber—Varieties.

To Mr. Byrne.—There are no clumps of second growth trees of any consequence in our district. I am told by those who use timber that they prefer the second growth as being finer in the grain and tougher. This is particularly true of ash and hickory. Red oak is found in our part of the country. I have heard people speak of black oak trees, but not as a commercial article; they prefer the white oak. There is a good deal of maple in our district, chiefly hard maple, though there is soft maple too. Soft maple is not used for any commercial purposes that I am aware of. We have not much bird's eye maple. It is sought after for cabinet purposes. We have both black and white ash, but it is only the white that is sought after much, though the black may be sawn into bolts, etc. We have no tamarack of any size; it is used for hop poles, etc. *Arbor Vitæ* grows in our section of the country under the name of white cedar, though it is not that the botanists call white cedar; properly speaking, there is no white cedar in this country. *Arbor Vitæ*, as grown near St. Catherines, is not used for fencing purposes; it is a mere shrub with us. We have a good deal of basswood in our district, but it is not used very much for manufacturing purposes. It is used to some extent by carriage-makers and others when they want a light article; it is also used for making barrel-heads, because the wood they have been using heretofore has almost given out. Very little iron-wood grows in our district; with regard to maple for the manufacture of sugar the product of the cane is taking its place largely, because it can be made so much more cheaply; even the maple woods that used to be tapped when I was a boy are no longer tapped, for the reason that it costs more to make the sugar than it is worth. When they include the labour expended in making maple sugar, and the fuel they use, they find they can go into the market for the same money and buy nearly as much again of sugar cane. Beech, maple and hickory, are the best woods in our district for fuel purposes, hickory being the best, maple next, and beech next, though there is not much difference between the two latter. There is not much pine in our district.

To Mr. Dymond.—Coal is used in our cities and towns altogether, you may say, though there is a certain amount of wood used for kindling. It pays the farmer to look to his woods for the purpose of fuel, for many of them have to buy coal just because they are foolish enough to denude their farms of trees. With regard to poplar for the manufacture of paper, I think the best for that purpose is the *Populus Tremuloides*; it is more like the silver poplar than the Lombardy, and is sometimes called the weeping aspen. I believe the silver poplar would answer the purpose, though I have no experimental data upon which to

give that opinion. It grows freely with us, and I think it would be likely to grow and thrive on poor land; it makes wood very rapidly and grows to a large size. I do not know of any other use it is put to; it might be useful in making charcoal for powder in common with other wood. With regard to the European larch, it has not been largely introduced into this country; it is a fast growing tree, and so far as experiments in the West have been made it seems likely to prove valuable timber for railway ties; they are looking to that purpose, and planting it in the Western States. I do not know of any plantation in Canada. To arrive at a size at which it would have a merchantable value for railway ties or anything of that sort, I think it would require about twenty years. Its cultivation in Europe has been very successful; there are large plantations in Scotland, and they are found to be profitable investments. I do not think there is any part of this Province where it would not grow, for it flourishes on hilly, rocky land, in Scotland. Nothing has been done in the way of publishing a hand-book of forestry in this country. The United States Government had a large book prepared under their direction with a view to disseminating information upon this subject; I refer to one of the Government reports. I know of nothing for public circulation among the farmers.

D. W. BEADLE.

MR. DEMPSEY'S EVIDENCE.

Upon resuming, Mr. P. C. Dempsey, of Albury, was called and examined.

To the Chairman.—I represent Lennox, Addington, Hastings, Northumberland and Prince Edward from the lake northwards, in the Fruit Growers' Association and Agricultural and Arts Association. I have been engaged in fruit culture about forty years, and as a business for the last twenty-five years. During that time I have had opportunities of becoming tolerably conversant with the fruits of the districts which I represent.

Fruit Growing in the Bay of Quinte District.

We grow nearly all the small fruits, apples, pears and plums. We grow very few cherries, and though there are few peach trees I could recommend peach culture there. Apples are the most important fruit crop we have. Probably about seventy-five per cent. of the whole area under fruit is devoted to apples, perhaps more. Not more than one-third of the apple trees in our district are in full bearing, probably about one-fourth. Fruit culture is extending rapidly throughout our district. There are a great many acres devoted to small fruits at the present time, principally strawberries. There are raspberries, but only a few acres of grapes. Very few persons have as much as an acre of grapes. I have no means of ascertaining the quantity of apples produced in our section, but it is large. We grow all kinds of apples, summer, fall and winter, principally winter apples. For an apple orchard I would select a porous open sub-soil, and in our section I would be very careful to get an elevated position. I prefer a sandy to a clay soil. We can grow tender varieties on an elevated position which we cannot grow in the flatter soil of the valleys. I think there is very little choice with regard to aspects. I have observed some of the best and most successful orchards grown upon a slight inclination to the north. I would prefer such an aspect if I could get it; however, I should not hesitate on that point if the soil was right. I have an orchard of about 3,500 trees. Our trees were planted twenty-four feet apart each way, but if I was starting again I would make the distance thirty feet. For pear trees twenty feet would be sufficient; as well as for cherry trees. For plum trees perhaps fifteen feet would do.

Age of Orchards—Prices—Demand.

To Mr. Brown.—Our trees are all ages from one to twenty-five years. We have of trees, bearing and coming into bearing, between 800 and 1,000. As to the average produce per tree, I could not tell from my own trees, because the majority of them are

quite small, and those that are bearing are mixed variety; but there is a gentleman near me who has an orchard of 100 Calverts, with which I am just as familiar as my own. The trees have been planted about fourteen years, and have attained a size of about seven inches in diameter. Last year they took about 175 barrels from it, but that was not an average crop. Taking one year with another we could safely calculate upon an average crop of 200 barrels. I know another orchard of the Northern Spy a little larger. I don't know the age of the trees, but they have been neglected. The orchard produces from three to six barrels per annum per tree. The trees are planted a little less than twenty-four feet apart, and the trunks probably average about nine inches in diameter. Of summer apples for profit I prefer the Early Harvest and the Red Astrachan. We readily get from 50 cents to $1.00 per bushel, or about $2.00 per barrel for summer apples, though the price, of course, depends considerably on the quantity grown. The figures I have given will apply to a good year. Some years we can do nothing with them. The local demand is not sufficient to consume what we grow. The surplus is usually disposed of at Montreal.

Profitable Varieties.

People are too apt, with regard to the varieties I have named, to let them hang on the trees to see if the local demand is not going to be sufficient, until it is too late to ship them. Summer apples should be picked immediately before they ripen. Of fall apples I don't know of any so profitable as the Duchess of Oldenburg. The St. Lawrence is also profitable with us, though it occasionally spots a little. I don't cultivate the Gravenstein very much, the tree is inclined to be tender. Except for the two varieties I have named we do not usually get as good a price for fall as for summer apples. Some years our fall apples sell well, but other years they are so worthless as hardly to pay for shipping; they will average about $1.25 per barrel. We consider the Duchess of Oldenburg the hardiest and most productive. We have found the two varieties I have named the most suitable for shipment to Montreal and Ottawa. Of the apples sent to Montreal I don't think any go to Europe, though a great many are shipped to Quebec for consumption there. I agree with Mr. Beadle as to the qualities of the Duchess of Oldenburg, but I cannot tell why I do not concur with him as to the St. Lawrence. I have only one tree of that variety in my garden, it has been planted fifteen years, and though it only bears alternate years, when it does fruit it produces about six barrels of the best quality of apples, which would be an average of about three barrels per annum. If the Duchess of Oldenburg is not allowed to overbear, it will bear annually, but if it does overbear the fruit is liable to split. If a portion of the crop is shaken off the tree when it is too heavy it will bear annually.

Soil—Manure—Cultivation.

To Mr. Byrne.—Trees are longer lived if planted on a sandy porous soil than on any other soil. My opinion upon that point has been formed from observing the wild trees of the forest. There is a great deal of that kind of soil in Northumberland, on rolling white oak ridges, and wherever the apple tree has been planted there it flourishes. I am planting on similar soil, though it is a little heavier.

To the Chairman.—After setting out my trees the principal manure I use is leeched ashes in small quantities. The cultivator is the best manure we can apply. We do not apply barn-yard manure to any extent—we cannot get it, or we would apply it. I prefer a loose soil, thoroughly cultivated, to any manure that we have used. We have planted trees on soil that we were told would not bring a good crop of rye. It had been cropped with rye and buckwheat for forty years, and had grown up with a small undergrowth after a bad clearing. We cleared it off and cultivated it thoroughly, and we got a fine growth. Our orchard is protected, by a hill, from the west, but it is not protected from the summer heat. It is only a few of the very hardy varieties that will succeed on low land, while on light porous soil the tree matures its growth early in the season, and is

[*Mr. Dempsey.*]

prepared for the winter. We cannot drain damp soil sufficiently to grow the tender varieties. The difference consists in the fact that on the light soil the wood ripens early in the season. The soil I refer to I would call a sandy loam, though it varies in spots. Some spots in the orchard near us, where, as I mentioned, the Northern Spy is flourishing, are drifting sand. Upon our land the drifting sand gradually changes to a slightly heavier soil, like loam, until it runs into a clay loam, where the trees do not flourish so well as upon the sand—particularly some varieties.

Winter Varieties.

It is very difficult for me to say what varieties of winter apples succeed best in our district, because we have a severe climate, and such a variety of soils, that in a favourable locality we can grow any variety of winter apple. Again, we have fruit growers who dare not plant the Baldwin and the Greening, while perhaps they may be grown successfully in another orchard a mile away. Judging by my own experience, we have no apple that can compare with the Ben Davis as a profitable market apple, if grown upon favourable locations and soil. For retailing, in Belleville, it brings the highest price of any apple we have. Grocers prefer them to the Northern Spy as a counter apple. The variety which I esteem best is the Red Canada, and even for market they are the best if properly grown. They require a warm soil, and of course we have some localities which are not favourable to their growth, and in these they are liable to vary in size, and to spot. The Golden Russett does not succeed very well with us, and we don't find it profitable. In favourable localities the Baldwin and Greening succeed well. The Calvert, if properly handled, is a profitable apple, though it does not belong to the winter varieties. It should be picked early in the season, even when it is quite green; if so picked it is one of the most profitable apples for shipment to Europe, as it commands fancy prices. We grow a considerable number of Snow Apples. You will find it flourishing in some localities, and perhaps forty rods away it is a failure. I could never understand the cause of this peculiarity. We have no tree that is more hardy, but the fruit is liable to spot. We have not cultivated Grimes' Golden to any great extent. The Northern Spy is highly esteemed in some localities, but is condemned in others. In the less favourable localities the Tallman Sweet and the Golden Russett are about the only apples that will succeed unless top-grafted. There is no market for the Tallman Sweet in our district. My experience with the Ben Davis is rather limited.

Apples for Exportation.

For exportation to Europe, the Baldwin, the Rhode Island Greening, the Northern Spy, and the Red Canada are the most in demand. The Ribstone Pippin is mentioned in all orders which we receive from Europe. It grows very finely with us, but is not sufficiently productive to pay us. I have not shipped any to Europe, but have filled local orders. Sometimes I have shipped a dozen barrels in a season to local orders. The Golden Russett, the Roxbury Russett, the Northern Spy, the Ben Davis, and the Red Canada keep the best in winter.

A Choice Apple.

We have an apple in our locality to which I think some attention should be called. I noticed that in quotations from England there is a variety called the Rock Apple, which has commanded a very high price there. It is described as a flat red apple, with specks, and having a large open calyx. We grow an apple exactly of that description. I had some which were rolled out on the first of July, and I found it was not necessary to re-pack them, and sent them to the market. They brought a very good price. We call them the Freckled Mollie, though I am satisfied that it is the same variety which commands so high a price in England. The apple is liable to get a little one-sided; it is a very dark red in colour. It cannot be cooked soft. The reason it brings such a price is because of its long keeping. I think that quite recently it commanded forty-

eight shillings a barrel in England. It does not grow in sufficient quantities in our section to be shipped from there, and I think the supplies must have come from farther east.

Price of Winter Apples—Seedlings—Blight.

It takes about 20 per cent. of our production to supply the local market. The usual price for winter apples is from $1.25 to $1.50, exclusive of the barrel, for first quality. We have some very fine seedling apples which are not cultivated elsewhere. There is one variety, which originated in our county, called the Prenyea; it is esteemed very highly as a dessert and cooking apple. The tree is an annual bearer. About ten years ago, when the apples were just nicely formed and were between the size of a pea and a marble, there was a heavy rain followed immediately by a very hot sunshine, and the apples in my orchard turned black, as did those immediately adjoining to them. The blight went from that into my pears, and we had a pear blight—the first I ever saw.

Insect Pests.

The borers, if neglected, are very destructive to our trees. We have both varieties, but the one that does not penetrate into the centre of the tree is the most common. We use some of the means to destroy them mentioned by Mr. Beadle. The tent caterpillars are also very injurious if neglected. There is no remedy for them but to gather them. The forest tent caterpillar never was destructive with us. We have also a few of the striped variety described by Mr. Beadle, but it has not been very common. I have never seen the codlin worm in my orchard, though it has been in the neighbourhood for ten or twelve years, and some have suffered a great deal from it, and in the county of Northumberland it has caused considerable trouble. I take no means to prevent them.

A Method of Cultivation.

A gentleman of my acquaintance, Mr. John P. Williams, has adopted a system of cultivation which I think is worthy of notice. He cultivates in the spring until about this season, ploughs his land twice and sows it with oats; when they are about four or five inches high he buys a lot of sheep, turns them on the land, they live on the growing oats during the summer, manuring the land, lying under the shade of the trees and devouring falling fruit. The sheep do not do any injury, and his orchards are flourishing under that system. Young trees might be injured, perhaps, but this was an old orchard of rough bark trees. The most successful orchards I have observed have been cultivated constantly without being seeded down. There is considerable cider manufactured with us, but it is generally made from the imperfect fruit which we reject when packing for shipment.

To Mr. Byrne.—With regard to the orchards of which I spoke, one of which was successful, and the other not, though they were not a mile apart, one was upon bottom land and the other on limestone or gravelly soil at an elevation of perhaps two hundred feet above it. In this orchard were produced Greenings and Baldwins, and the proprietor told me he would plant no other varieties. On the other kind of soil they could grow nothing but Duchess of Oldenburg, Red Astrachan, Snow Apples, Golden Russets and Tallman Sweet.

To Mr. Dymond.—The Mr. Williams, of whom I spoke, lives about twenty miles from me. I visit him about once a year. He is one of our most extensive fruit growers and shippers. I attribute the safety of his trees to their advanced age and their having rough bark upon them. If an orchard is constantly cultivated, but cultivated shallow, the roots of the trees are not disturbed, but by allowing it to run to seed the small roots seem to be encouraged to the surface. Ploughing certainly destroys a number of the roots and checks the growth of the tree, but this is prevented by frequent shallow cultivation.

[*Mr. Dempsey.*]

Trade with England—Profitable Sorts.

I know very little of how the apple trade to England is carried on. I don't know of any special means being taken by any firm or agency there to exhibit Canadian apples and take other means for their introduction. The Red Canada is a very profitable apple to cultivate. It is prolific where it succeeds, though it is liable to vary in size and to spot in some localities. I attribute the popularity of the Ben Davis to the fact that it only requires a warm soil to come to maturity, though it is perfectly hardy in almost any soil. It is an apple which I don't like myself for either dessert or cooking. It comes the nearest to being without flavour of any apple I know anything about.

Pear Culture—Varieties.

To the Chairman.—Pears can be successfully grown in our neighbourhood. I prefer a clay loam for them. The age at which standard pears begin to bear varies greatly according to the variety. Some varieties require from eight to ten years, while others bear readily three or four years after planting. For an early summer pear there is no better than Manning's Elizabeth, which is a delicious fruit and very prolific. Next to it comes Osband's Summer Pear and the Rostiezer. After these I would select Clapp's Favourite. We have tried the Tyson, it is a very fine pear but it does not produce with us. The Beurre Giffard does not succeed very well with us. After Clapp's Favourite I would place the Bartlett, but it must have a favoured locality, as the tree is tender; it is more so than any of the varieties I have mentioned. After the Barlettt would come the Flemish Beauty, which has, as a rule, been successful in our neighbourhood, though it proved a failure with me. Ninety per cent. of mine were culls last year. Some of them were cracked so that they lost the appearance of pears. It is about five years since they began to crack with me, and they appear to be getting worse each year.

To Mr. Brown.—In some specimens the splitting begins when they are about an inch in diameter, and then, of course, they never attain any greater size; others again will attain nearly their full size, and one side of these will probably be eatable.

To the Chairman.—Next to the Bartlett I would place the Beurre Hardy and the Ananas d'Ete. The Duchess d'Angouleme is a very fine pear, but it does not produce with us. The White Doyenne is not planted extensively in our neighbourhood, but Mr. Graham, of Sidney, prefers it to any other variety that he cultivates. We grow a considerable number of the Beurre d'Anjou; with us it keeps until Christmas; we esteem it very highly, but it is not very productive in our section. For winter pears I would place above all others the Josephine de Malines, because it produces so much fruit. The fruit is rather inferior for the first few years, but when it has been about ten years planted it is very fine. It has beautiful rose-coloured flesh. The varieties I have named are profitable in our district. I prefer pear trees grown on their own stocks, as in a severe winter the quince stock are destroyed, owing to the roots being near the surface.

The Market—Blight—Picking.

Our surplus pears are usually shipped to Montreal and Ottawa. None are shipped from our neighbourhood to Europe. The average price per barrel is from $5 to $8. Our trees have not been subject to blight for the last few years. Some ten years ago they had it, and it continued for two years. Remedies have been tried, but none have been successful except cutting out the affected parts. I never observed anything like borers. The slug is destructive to the leaves, but its damages do not amount to much. We pick the Bartlett and Clappe's Favourite when it is about two-thirds grown and place them in close drawers, where they ripen very finely.

To Mr. Brown.—I would not say that what I have stated with regard to apples and pears would apply as far east as Glengarry. I know by report that some of the hardier varieties succeed in that district. We give a different cultivation to the pear to what we do the apple. We do not cultivate the pear at all, and we have had no blights since we

ceased to cultivate. We put on very little manure, and if we put on any it is in the form of leeched ashes. We mow away weeds occasionally.

To Mr. Byrne.—Pear trees twelve years planted produce an average of about six bushels to the tree.

To Mr. Aylesworth.—The danger with such varieties as Clapp's Favourite is by leaving them too long on the trees you lose your whole crop and your customers as well. It would be unfit for use if left on the tree until it was ripe.

Choice of Localities.

To Mr. Dymond.—There are localities in the district which I represent where pears can be successfully grown, and of course we select those localities. When I spoke of not having seen any blight for many years, I spoke only of my own experience, for I have seen it on other pear trees. They were grown principally in gardens and the soil was thoroughly cultivated. I have no theory to account for cultivation encouraging it. The more rapidly the tree grows, the more liable does it seem to be to attacks of blight. I don't regard the cultivation of pears as being as profitable as that of apples. I would not recommend the encouragement of pear growing on a large scale in that district.

Select Varieties for England.

I know nothing of the English market for pears, or whether there is any particular variety that is likely to be favourably received. There are certain varieties which would be sure to be well received there, such as the Josephine de Malines, which has a high reputation there, just like the Ribstone Pippin apple. I don't know of any locality where that apple is largely cultivated. It is a shy bearer, and will not produce more than one-tenth of some of our other varieties, so as a Canadian apple it would not be as profitable as many other sorts. I think Cox's Orange Pippin is a good apple. I fruited it for several years. I have not been much engaged in raising new varieties, though I have raised some. None of the apples have fruited yet. As distinguished from Mr. Beadle, my vocation has been chiefly the production of fruit, while his is the production of trees.

Limits of Pear Culture.

To Mr. Aylsworth.—Q. In speaking of the locality of the Bay of Quinte, do you know of pears being successfully cultivated further back than the first or second tier of townships. A. Mr. Graham's pear orchard is about eight miles back of the Bay of Quinte, where he succeeds in producing varieties that are not hardy with me. Though he has not the advantage of the modifying influences of the water, he has the advantage of an elevated position. My place is on the northern side of the county of Prince Edward, and though I have fruits on both sides of the Bay of Quinte, on the southern side of the county, next to the lake, they grow some varieties of fruit that we cannot grow; the lake appears to modify the temperature. For instance, they can grow some varieties of plums that we cannot. The climate is more mild on the south side of the county. The blossoms are retarded in the spring, but they are never affected with the frost. I don't remember one perfect failure of fruit in my whole experience, though I have known one particular class of fruits to be cut off. The grapes were a failure two years ago; very few of them ripened. I have never seen the apples a failure.

Plum Culture—Varieties.

Plum culture is quite profitable in our district. I would prefer a heavy brick clay for plums, something so stiff that the curculio cannot get into it. Such a soil will produce good plums, and there will be very little trouble with the curculio. I have some growing where there was once a brick-yard, and I am never troubled with the curculio. There is nothing superior to the Damson for cooking purposes. The Damson tree is thorny.

[*Mr. Dempsey.*]

is rather a slow grower and yet attains a great size. It frequently produces from four to five bushels to a tree. It is very easily cultivated. The curculio takes its share of the fruit, still the tree crops abundantly. It may almost be said to grow wild with us and often grows in the fence corners. They are regularly harvested and marketed and sell well in Montreal. When the tree is not overloaded it is a good dessert plum. The skin is perhaps a little thick, but not enough to make it objectionable. I don't know of these being cultivated in any other section of the country; I have noticed what were called Damsons, but they grow differently from ours. I am not able to say where it came from. It is peculiar to the county of Prince Edward. Of the standard cultivated varieties, I prefer first the Imperial Gage, and then the Lombard, for home use. They are equally prolific. There are some varieties I appreciate on account of their coming in late, such as the prunes. We have fresh plums in the winter by simply spreading them out thin in a cool place and excluding the frost from them. I have fruited Glass' Seedling and prize it very highly. The Jefferson grows very slowly compared with the other varieties I have named. The great trouble with us in raising the finer varieties, such as Pond's Seedling, the Washington, the Peach Plum, Smith's Orleans, and others, is that they rot in an unfavourable season. The most profitable for market, outside of the native plum I mentioned, is the Lombard. We have had very few of Glass' Seedlings, and the tree has only fruited with us one year. Shipments of plums are chiefly made to Montreal and Ottawa. I could not give you any idea of the quantity we produce. Two years ago my brother produced 700 bushels himself. Most of them were blue plums grown in the fence corners. He had also a considerable quantity of Lombards. He has been planting largely this year.

To Mr. Dymond.—I have seen a few sprouts of the native plum in different parts of the country. I don't know how they succeed out of our district.

Price—Marketing—Insects—Birds—Manures.

To the Chairman.—The average price of plums is from $1 to $2 per bushel, though we sometimes get fancy prices. The blue plum I spoke of carries well, as do almost any of the other varieties if picked on the green side. The Lombard should be picked before it has fairly coloured. The best way of packing them is in crates made of broad slats holding about one-half a bushel. There are no insects, other than the curculio, troublesome to the plum in our district. The trees suffer a good deal from black knot. There is no remedy but amputation, but if it is attended to it can be conquered. The Lombard and most of the other finer varieties are subject to rot. I don't think the Lombard and Imperial Gage are less liable to rot, but they produce so much more that the effect is less noticeable. I don't remember seeing a blue plum rot at all. I never observed any bird injuring the ripening plums. The robins would pick them if they are over-ripe, but not otherwise. We have tried different manures, but we have found nothing equal to leeched ashes; we apply it to all our fruit trees.

To Mr. Brown.—We apply the leeched ashes especially to the trees if they are small, and if they are larger we apply them to a wider circle around the trees, judging the distance to which the roots extend.

Peaches.

To the Chairman.—We don't grow peaches at all successfully. There are just a few trees grown, and they have succeeded the last three or four years, when we have had mild winters. There is one tree in Mr. Penton's grounds, in Belleville, which grew up from seeds accidentally left there, and which attracted a good deal of attention owing to its being so fine. Efforts have been made by allowing the trees to root only on one side, so that they could be undermined and bent over for protection during the winter, but they failed because the fruit buds would rot. The only way in which they could be managed at all successfully was by growing them in pots, setting them in a woodhouse for winter, and setting them out in the spring. I got from one to four dozen peaches from each pot in that way.

[*Mr. Dempsey.*]

Pruning of Apple Trees.

To Mr. Brown.—I have paid some attention to the form of apple trees. I have amused myself by training them in cordons, by grafting the ends together, and also in pyramids, and almost every other imaginable shape, by adopting the system of root pruning, but there is nothing pays so well in apple culture as a nice round head, not thinned out too much. I tried to get them in umbrella form.

Apricots—Nectarines—Cherries.

To the Chairman.—We grow no apricots or nectarines. We have a few small cherry orchards. The cherries that are grown profitably are of the Kentish variety, I have grown a few Morellos and Dukes. The Bigarreaus and Hearts are not produced in our district. We don't require to ship any cherries. In the home markets we sell them at from five to ten cents a quart. The curculio injures the cherries some seasons, but in others we don't notice any effects from it. No other insects are injurious to the cherry, and the fruit rots very little in our district. The cedar birds, robins and orioles destroy some of the fruit. It is very seldom that the blackbirds do any damage. The blue jays eat them, but these birds are so few in number that the damage they do is but slight. We have no good seedling cherries in our district, that I am aware of. We grow no quinces.

Grape Growing—Successful Varieties.

We grow some varieties of grapes very successfully. The variety that succeeds best is the Delaware, and it appears to be one of the most profitable for market and for home consumption. We grow the Concord to a considerable extent. The Delaware brings about double the price of the Concord. If I were planting a vineyard I would limit myself to these two varieties. I have planted a good many of Rogers' red varieties on account of the high prices they command; red and white grapes have commanded about double the price of black grapes for the last two years. The first grapes we get on the market are the Champion and the Hartford Prolific, and they really destroy the taste of the people. Most of them have been accustomed to growing wild grapes. Those two varieties are not much in advance upon the wild grape. The Champion grape commands a good price and sells readily. There have been very few on the market. They usually bring about twelve and a-half cents. I have not had much experience with the Brighton, having only fruited it once. I recommend Rogers' Nos. 3, 4, 9, 15, 22, and 44. I have raised large numbers of seedling grapes of my own from crosses. I have planted the Burnet and No. 25 largely. The latter is a white grape, a little late, but it ripened last year with us. I have fruited about twenty varieties of seedling grapes. We describe them as quickly as we ascertain that they are good for anything. Our highest number is 60, but it would not be possible to tell you how many I have fruited, as there are some intervening numbers that never fruited. In order to test a grape for its fruit, it should be fruited more than one year, as sometimes it will be very superior the first year and yet fail the next year. They don't generally show their best points at first, but may gradually develop afterwards. In my experience that remark applies to other seedling fruits besides grapes. I have never discovered any disease in the roots and very little in the leaf. We had the mildew last year to a considerable extent on some of Rogers' Hybrids and Allan's Hybrids, and extended even to a Martha which stood close to Allan's Hybrid. I never saw the fruit rot on the vine except a few specimens last year; indeed it could scarcely be called a rot, it was rather that the fruit seemed to cease growing. Insect enemies do not damage our grapes to any extent worth speaking of; the robins, however, are very destructive.

The Robin.

To Mr. Dymond.—We do not destroy the robins, but we do what we can to frighten them away, and have often been sorely tempted to resort to their destruction. I never

observed that the robin was of much benefit to us as an insectivorous bird. I don't think he kills enough insects to repay us for the fruit he destroys. I never observed any damage by the sparrows, but I have heard other people say that they destroyed some of the currant and gooseberry buds. On the other hand the Hon. Mr. Walbridge, who is a close observer, told me in a conversation the other day that he did not believe that the sparrows were destructive to the fruit. I have never destroyed any birds—even crows—but I find it a good plan to fire a rifle ball within a few feet of them if they are destroying fruit. I have seen robins feeding on grubs and worms, but to a very limited extent. I believe young robins are more destructive than old ones.

Progress in Grape Culture—Wine Making.

I don't think we have attained to anything like perfection in grape culture, having regard to its possibilities. I have not obtained a grape which in all respects I would regard as a choice wine grape. The progress that has been made in that direction leads me to suppose that we may succeed in getting one. The grapes I raise are for table purposes, though several gentlemen in my neighbourhood raise grapes to manufacture wine. The Clinton is almost exclusively used for making wine. I tasted some of the wine, and it seemed to me to have more of the flavour of rhubarb than of grapes. One gentleman says he finds it profitable to make wine; he sells it at $2 a gallon, but I don't know where he gets a market for it. It is ten or eleven years since I tasted the wine to which I have referred, and it may have been improved since. I do not claim to be a judge of wine.

Strawberries.

To the Chairman.—We grow a great many strawberries in our district—Wilson's variety chiefly. We don't ship many. In favourable seasons the usual product of Wilson strawberries is from 2,000 to 3,000 quarts an acre. The price varies very much—last year it was about five cents per quart. Perhaps the average would be about seven or eight cents. I have never observed that the birds injured the strawberries very much—probably because we produce enough for ourselves and the birds too. There is a little insect which interferes with the roots of the plants, but it is easily kept under by removing the vines, and not planting on the same soil. It is an insect which burrows in the ground. Then the larva of the May beetle is a serious annoyance to us sometimes, as we have no way of destroying it when it gets into a patch. The larvæ are reddish and very minute. We grow most the red raspberries—the Philadelphia most extensively, and after it the Clarke and the Herstine.

To Mr. Brown.—Strawberries will succeed anywhere almost, if the land is properly cultivated and drained. We cover them in winter with straw, and do not remove it in spring. We part it a little to let the plants through, and the straw prevents the berries from getting into the sand. I don't think that the aspect makes any difference in raising strawberries.

To Mr. Dymond.—We have about five or six acres of strawberries this year. We are gradually increasing the area. We have no difficulty in obtaining assistance in the picking season. We usually pay one cent per basket for the picking. The baskets are heaped so that they will fill an imperial quart measure.

Raspberries.

To the Chairman.—The Philadelphia raspberries are the most profitable variety with us, though there are some of the newer varieties which I have not tried to any great extent. The fruit usually brings about 8 cents a quart—that was the lowest price last year. We cultivate the Black Cap raspberries, the Doolittle, the Ontario, the Mammoth Cluster, Davidson's Thornless, the Seneca, and some of Saunders' hybrids. The Ontario and the Mammoth Cluster do best with us. Davidson's Thornless is a fine bearer, and convenient for picking, but we find that the ends of the canes freeze in win-

ter. The hybrids are very fine. No. 55 with us will produce more berries than any other variety I have ever seen, though the fruit does not ripen all at once. Last year we had berries for the table for some weeks, and it is a favourite for home use on that account. I have never tried them for the market.

The Commission then adjourned until Friday, at 9 o'clock a.m.

P. C. DEMPSEY, recalled.

GOOSEBERRIES—CURRANTS—MELONS—CRANBERRIES.

To the Chairman.—With regard to currants, gooseberries, and so forth, I agree generally with Mr. Beadle, except in one thing, that is, in his statement that the Versailles and Cherry Currant are the same fruit. One has longer bunches than the other, and, though the size and flavour are about equal, one is of short stocky growth, while the other is long and slender. The Victoria with us does not compare with these two varieties. Mildew is very prevalent in our district on gooseberries. The Houghton seedling is far superior as a market berry to Smith's Improved, which mildews just as bad with us as the English berry. It is only the Downing and Houghton seedling that we can grow with any success, and they are cultivated to a considerable extent. The average prices are from six to eight cents a quart, when green. There are large cranberry marshes back in the counties of Hastings and Northumberland, most of them connected with the Trent River in Northumberland. I am not aware of any attempt being made to cultivate them. The berries come into our markets in large quantities and appear to find a ready sale. I have paid a good deal of attention to the cultivation of both water and musk melons. Among water melons I esteem the Long Island very highly, though it is not so early as some others. The flavour is very good. Phinney's early is the first to ripen. The melon crop may be made a profitable one by studying the business closely. We may grow a fine crop of melons one year and they are much sought after, and next year we will find the majority of the farmers going into their cultivation too, and I find that though taken up immediately it does pay to continue their cultivation for the purpose of driving out the over-competition as the prices then become remunerative. The average yield per acre varies very much. I have seen about ten tons per acre, but that is a large crop and the average would be perhaps about six or eight tons. I also cultivate musk melons. For the table I esteem the White Japan and Skellman's Fine Netted. The nutmeg musk melon is more profitable for the market. They ripen with us about from the middle of August to the first of September. We usually manure them with rotted manure in the hill, about a shovelful, and sometimes a handful of superphosphate with a little salt thrown in the hill. They should be kept constantly hoed afterwards, and well earthed up under the leaf so that the seed leaves are lying flat on the earth. The borer is not very destructive. There is no insect that injures melons except a small yellow striped bug. I prefer to grow the fruit on sandy soil.

To Mr. Aylesworth.—In Picton there are some cranberries cultivated in gardens for private use, and they are the best I have seen.

INSECTIVOROUS BIRDS.

To the Chairman.—I have given very little attention to the question of insectivorous birds. We have some birds that live exclusively on insects, such as the one we term the phœbe bird. The barn swallows live chiefly on small flies which they take on the wing. Then there is the king bird which lives exclusively on insects, and sometimes visits our bee-hives and destroys the drones.

To Mr. Dymond.—I think the law with regard to insectivorous birds is generally observed in our section.

To the Chairman.—I am very little posted on the good which the robin does, but I have had quite a sad experience as to the damage he does, as I have had nearly my whole crop of grapes destroyed by robins. They are about as destructive among a lot of grapes

as a flock of hens would be. I do not know if the cherry bird has any redeeming qualities, but I do know that it is not nearly as destructive to our fruit as the robin. The cherry bird devours a good deal, but the robin comes and destroys half a dozen bunches in getting his fill. The robin will also puncture apples and pears. On the whole I consider the robin an injurious bird, not deserving legal protection. Sparrows are not numerous in our section of country.

The witness was then examined on the subject of bee farming. His evidence on that point will be found elsewhere with other information on the same topic. He was then questioned respecting

FORESTRY AND TREE PLANTING.

To the Chairman.—It would be very difficult for me to give you the proportion of our district which is in forest, or how much of it is second growth. There is considerable original forest preserved. We have some swampy land near us and some near Picton in our county. Almost every farmer in our section has preserved a sugar bush varying from ten to thirty or forty acres of original forest. There will probably be altogether about fifteen per cent. of original forest remaining. I do not know of one farm that is uncleared. Then there are some farms off which the timber has been taken, and a second growth of young trees sprung up; not of offshoots of the old stumps, but young trees. There is one little patch of land, a few acres in extent, that had been cleared about six years ago, and lately I noticed it was covered with young poplars from three to four inches in diameter. They make wood exceedingly quick. Some of them are thirty or more feet high. The soil of our timbered land varies very much.

THE WOODS OF THE DISTRICT—THEIR USES.

The oak is common with us, so is the elm, ash, and hickory. Of walnut we have none except what has been planted. We have plenty of butternut, cherry, maple, beech, basswood, birch, larch, willow, sumach, and ironwood. We have also, pine, cedar, etc. There has been a good deal of hardwood shipped from our district in the form of logs, and there is some remaining yet. The Grand Trunk Company got a good deal of oak from our section for the purpose of manufacturing their cars, etc. It is all white oak. There are a good many ties made of oak and supplied to that and other railways. Pine makes rapid second growth in sections of the country where it flourishes. In fact pine and poplar are two of the most rapid growing of forest trees. The hardwoods are considerably used for the purpose of making timbers of buildings, and occasionally we find persons finishing the inside of their dwellings with hardwood. There seems to be an increasing tendency to use our ornamental woods for internal fittings. The woods chiefly used for manufacturing agricultural implements are oak and elm. For fork handles, hoe handles, etc., ash is generally used. In all our agricultural manufactories they use elm considerably, though oak is also used. In carriage making we have a demand for hardwoods, hickory being used for most bent stuffs required in carriages. The spokes and all the finer parts are generally made of hickory. For furniture we use basswood and butternut, as well as cherry and maple. Butternut is considered the most valuable for this purpose. Maple is used to some extent, but it is very hard to work. The commercial value of these woods varies from twelve to fifteen and twenty dollars a thousand. I could not tell you at what age these trees become merchantable. I remember a little hickory tree that was growing thirty-nine years ago, not much larger than my finger, and now it is twelve inches in diameter. I have heard the evidence of other witnesses in reference to the manufacture of paper from soft woods, but I do not think there is any manufacturing of that kind going on in our district. Poplar wood is sought for for

that purpose. I know some parties have bought considerable at three dollars per cord, and they have paid four dollars when they could not get it for three. I cannot give you any positive information as to the commercial value of these woods. Railway companies pay from twenty to twenty-five dollars per hundred for ties, and higher than that if they are of oak.

Planting—Thinning—Preservation.

I have had no experience in planting walnut. Very little attention is paid in our locality to the systematic thinning and preserving of old forests. For forest planting I would recommend maple, taking of course into account the variety of soil. The hard maple does not succed in all soils, but where it does succeed I prefer it. It flourishes in a dry soil. In wet soil I would use the soft maple. I would also recommend the hickory, the butternut, and the white cedar or *arbor vitæ*, and the white pine, which grows well on low lands. On very poor land I do not know anything that would succeed equal to the poplar or pine. If we could, through the medium of the press or by some other means, get our farmers to believe that they were going to be financially benefited by preserving their forests and planting new ones, they would likely pay attention to the matter, but it is all a matter of dollars and cents with the majority of people. No experiments in that direction have been tried in our neighbourhood. Some little blocks of forest have been planted with maple trees, with a view to their sugar producing qualities, and some of these have attained a diameter of six or eight inches and a height of thirty or forty feet. They have been planted some years. I do not think they received any cultivation after planting. As to the size of trees for forest planting, I have always been most successful with small trees, because we always manage to raise them with fibrous roots. The majority of people planting maples, plant them when they are about three inches in diameter, and cut the tops off them. I would prefer them from eight to ten feet high, and I would give them no subsequent treatment except to mulch them a little. The trees can usually be got from the forest and planted for about five or six cents a tree in our section of country. Scarcely anybody would charge for the trees. To raise trees from the seeds they should be gathered and sown as soon as they are ripe. When we have a belt of wood left as a screen for farms it generally causes the snow to light in the winter and protect the fall sown crops. I know of no trees better for that purpose than the Norway spruce, the pine, and the *arbor vitæ*. As to recommending deciduous trees, it all depends upon the locality. In some places a screen is only required for summer, and in that case I would prefer deciduous trees. The time required to make such a screen as I refer to effective, depends a good deal on the quality of the soil. Under favourable circumstances a very good screen can be obtained in six or seven years. The Norway spruce can be bought in our district at ten dollars a hundred when they are two feet high.

Ornamental Trees and Shrubs.

For planting around fields and public roads I think there is nothing better than the hard maple, but with us they are so liable to be attacked by the borer that they become unsightly on account of that, and soft maple is to be preferred. I think the linden tree makes a very nice road tree, so do the birches and elms. For the streets of cities and towns the kind of trees should depend on the width of the street. Some birches, elms, and ironwood trees would be very pretty on streets. They should be planted about twenty-five feet apart and when they attain a certain age each alternate tree should be cut down. I would rather see one developed tree than three or four crowded together. For ornamental trees for dwellings, I have nothing to add to the list already given. The tulip tree is too tender to thrive with us, nor does the maidenhair tree succeed in our district. I would add ironwood to the list, as I think it makes a very pretty tree. Among the shrubs, Mr. Beadle spoke of the dog-wood. There is a variegated leaf dog-wood, which is one of the prettiest shrubs we have. It is the European dog-wood and is quite hardy with us. There has been no encouragement given in

[*Mr. Dempsey.*]

our township towards the planting of trees. On an average I would make a difference of thirty per cent. between the value of a farm of a hundred acres without trees and the same farm with trees, though of course it would depend a little on the locality of the farm. Some farms are naturally more exposed than others.

Cutting and Pruning.

To Mr. Brown.—I think a farmer with care in selection and decent management would be able to re-plant parts of his own farm, either from his own bush or that of his neighbours at very trifling cost. I agree with Mr. Beadle about the cutting trees very close for shelter, though of course the question is one rather of fancy than of practical benefit. One row might be removed for instance without injuring the trees at all. I have not had much experience in pruning forest trees, but I think they look very much better when they are pruned.

To Mr. Aylesworth.—I am very particular as to the time of pruning our fruit trees. I do not believe in allowing a branch to grow where it is not wanted, and if pruning is required I generally do it the last months of winter, say the first of March, before there is any appearance of growth. I do it at that time principally because it is a time of leisure with farmers, but I think it is safe to do it at any time. I do not think it makes any difference whether the fruit or flower is on the tree or not. I never prune severely, as I think it is possible to destroy the tree by so doing. If a tree is allowed to thicken too much it is better to take two or three years pruning it than to take off too many branches at once.

Efforts to Encourage Tree Planting.

To Mr. Dymond.—As a rule the majority of fruit trees are not pruned at all, but where they are pruned, there are often more pruned too severely than not sufficiently pruned. When I planted the tulip trees I protected two of them during the first winter. I had them two years growing but they froze to death at last. The situation was a favourable one under ordinary circumstances. I have not carried out tree planting to any considerable extent on my own farm. I have done very little tree planting for protection for my fruit trees as we are fortunate enough to have a farm situated at the base of a large hill, and the protection is perfect in itself. I think if the question of tree planting was brought before the agriculturists of our county something like a systematic movement in its favour might be brought about. Nothing is being done in that direction now, though the Fruit Growers' Association is taking some interest in the subject of forestry, though very little has been done so far except in the way of discussions, which will be published in the report. We have tree pedlars in our locality, generally strangers. The trees they introduce for sale are always represented as being Canadian trees, but it is difficult to tell whether they are grown in the United States or Canada. I have seen considerable tree growing on the other side. It is difficult for us to compete with the Americans in the production of forest and shade trees, because their markets justify them in growing them in such large quantities that they can sell them cheaper than we. If we had to buy ten thousand trees for the purpose of planting, I think I could buy them as cheaply in Canada as in the United States. They would have the duty to pay. I think I could plant for twenty per cent. cheaper in the State of New York than here. I do not think the systematic collection of forest tree seeds has received any attention in Canada. With regard to the smaller trees there would be no great difficulty in collecting them. They could be gathered from the tree in sheets. I think it would be well to advise people as to the period of the year when to collect forest seeds, and if something in the way of such advice could be published in the press it would be a great advantage. I think the study and practice of foresty would have a considerable effect in the way of improving the minds of young people, and that the study of elementary agriculture and forestry should be introduced into our public schools, but the study should be made compulsory in order to be attended to properly.

[*Mr. Dempsey.*]

If made compulsory I think it would be looked upon with favour by the agricultural classes. I have observed some teachers in our schools who have started flower beds in the school yards and divided their pupils into classes, giving one or two beds for each class to care for, and they try to get up a spirit of emulation among the pupils as to which should have the most tasty beds, and the result was that the children took to cleaning out the beds and nursing them for their own amusement. None of our school yards are planted at the present time with shade trees or otherwise. I think it would be an advantage if such planting was attended to, and it would have a very desirable effect in a few years.

P. C. DEMPSEY.

MR. BEALL'S EVIDENCE.

Mr. Thomas Beall, of Lindsay, was called and examined.

Mr. Aylsworth acted as chairman *pro tem.*, in the absence of Mr. Saunders.

The Fruits of the Lindsay District.

To the Chairman.—I represent electoral division No. 5 in the Fruit Growers' Association, but I can speak more particularly for Lindsay and that part adjacent thereto of the country. The fruits cultivated in this district are: apples, pears, plums, strawberries, raspberries, red, white, and black currants, gooseberries, and grapes. I think there are more apples grown than of all other fruits. Plum-growing is not a success in our immediate neighbourhood, by which I mean a circle of a few miles around Lindsay. No peaches are grown, as the climate there is not suitable. I should think there was less than one-fourth part of the trees in full bearing; the reason why this is the case is that the neighbourhood in which I live is perhaps one of the best fields in Canada for tree pedlars and sharpers of any kind. More trees I think have been brought in, in proportion to the number of people, for the last ten years, than in any other portion of Canada, and yet there are fewer trees growing. I do not think one-half of those sold for the past five years have lived to the third year. The cause of this failure is the trees furnished by the tree-agents (a great many of whom are from the United States), and improper planting. In our immediate neighbourhood there are about six acres of strawberries, raspberries and grapes; grapes are not cultivated to any great extent. Though there are many persons who have grape vines, there is only one man who has attempted to grow grapes on anything like a large scale, and I am afraid he has not had great success. Of the other small fruits such as raspberries, strawberries, and so forth, we do not yet raise enough for our home market. Garden raspberries do not find ready sale, because in our neighbourhood there are large quantities of wild raspberries, which the children bring in at a cheap rate and supply the demand.

Varieties of Apples.

The apples grown in our district are principally fall varieties, but there are a few winter apples and a large number of summer apples; but there is not nearly enough apples raised in the neighbourhood to supply the demand in the town of Lindsay—that remark does not imply that the town of Lindsay itself consumes them all; our merchants supply the back towns to a large extent. I have classed the Duchess of Oldenburg as a summer apple because it ripens before the 1st of September, though in many catalogues it is called a fall apple. There was a dispute as to whether it was a fall or summer apple at the late exhibition at Ottawa. If an apple matures before the first of September it should be classed as a summer apple. We have the Red Astrachan, the Summer Rose, and the Tetofsky. The last named is not a good apple for market use; as soon as it is about ripe it must be used, or it becomes soft and mealy. I can sell all the summer

apples I can raise at seventy-five cents per bushel that can be grown there as early as the Summer Rose. The Red Astrachan is worth from two dollars to two dollars and fifty cents a barrel; the demand is much greater than the supply. I speak now only of summer apples, though the demand is not equal to the supply in any case. The St. Lawrence is the best of our fall apples, though the Alexander does very well. In the neighbourhood of Peterboro' the fall Pippin is largely grown, and is a very profitable apple. The average price for early fall apples—among which may be included the Duchess of Oldenburg—is about a dollar and a half per barrel. We have such a variety of soils and peculiarities of situation that the same kinds of apples have a very different appearance when grown only a few miles apart. On the Manvers hills they grow many kinds which we cannot grow. The St. Lawrence is the only variety that I am aware of which can be regarded as a profitable fall apple with us. The fall apples grown in our neighbourhood nearly supply the demand, and so cheaply that outsiders cannot compete. Large quantities of them are sold at seventy-five cents to a dollar per barrel. I use the term barrel because it has been employed here, but with us no person barrels their apples. We do not ship any. Of winter apples grown there the kinds most esteemed are the Yellow Belleflower, the Northern Spy, the Fameuse, and the Golden Russet; of these four the Golden Russet stands first, the Yellow Belleflower next, and there is not much difference between the other two. All of our crop is consumed at home, and the average price per barrel is from two and a half to three dollars. We have many excellent seedling apples growing in our neighbourhood, which I think should be looked after. I have seen at several of our exhibitions apples said to be seedlings which I thought would compare well with many of the grafted kinds. I have no doubt that during the last year I saw from twenty to thirty varieties of seedlings, and most of them were very good fruit. I cannot tell you what the varieties are; some of the standard varieties are too tender for our district. For instance, we cannot grow the Early Harvest, the Rhode Island Greening, or the Spitzenberg.

Insect Pests.

I am not aware that our trees are subject to any blight or other such disease. I have never heard of any person having trees destroyed by "borers." For a few years we have had the Tent Caterpillar, and the Red Humped Caterpillar; the latter not only infest the apple trees but many other trees, especially in the months of July and August. I think the Tent Caterpillar has had its day with us, and that we are very nearly rid of it. People have become pretty well aware of the means to be employed to destroy them at the proper time, and besides we have some other insect which destroys the nests of the Tent Caterpillar. The Codlin Worm is prevalent in the fruit, and I know of no remedy for its ravages. I think the soil of an orchard should be cultivated for a great number of years, as in my opinion cultivation is more beneficial than manure.

Local Experiences.

To Mr. Saunders.—The Spitzenberg is not hardy with us, and that is true of the whole section I represent, as far as I know. Few persons have succeeded in raising the Rhode Island Greening; the trees are not healthy and show evidences of disease a year or two after being planted. The Baldwins have not been grown north of the Ridges, that is, they will not grow in our section north of the highland, which is supposed to have been the northern boundary of Lake Ontario. I do not know of any person who has grown the Ben Davis, though possibly they are grown. Many excellent apples are grown with us, but the names which have been given them are rarely correct. For instance, when prizes are offered at our county fair for certain varieties, you will find in half-a-dozen entries as many different varieties, all exhibited *bona fide*. The exhibitors had ordered these particular trees and supposed they had got them. Last fall I saw thirteen exhibits of what were said to be Ribstone Pippins, and I do not think there was one Ribstone Pippin in the lot.

[*Mr. Beall.*]

Seedlings.

To Mr. Dymond.—The only means I could suggest to ascertain the value of the seedlings I mentioned would be to have samples collected at the proper time and forwarded to some person or committee to be tested. If sent to competent judges they would be able, I suppose, to classify them. There ought to be some means whereby the qualities of any good seedlings could be registered. I am quite satisfied that there are many excellent apples in this country unknown. I was not aware that there was any special committee of the Fruit Growers' Association for that purpose. I went into that section about twenty years ago and there were then many young orchards scattered over the county. The disposition to increase the culture of apples has been very strong, and I am surprised that it continues to exist at the present time after so many failures. Certain portions of our county, for instance, a part of Mariposa on Lake Scugog, are well adapted to the growth of apples, and as fine fruit can be grown as anywhere in Canada. When I went into the township of Whitby, forty years ago, I found a greater disposition then to believe that apples could not be grown there than there is now with us. I have no reason to doubt that apple culture can be carried on successfully to the north of us, but the land must be drained, as nearly all the high land has a springy soil.

Hardy Sorts.

To Mr. Saunders.—Grimes' Golden, as far as I know, is perfectly hardy. My trees fruited last year. I would scarcely regard it as a winter apple in this district. It is a most beautiful apple and the tree bears well. It is in its best condition about the first of December; then it is excellent. It is doubtful if pears can be successfully cultivated in our district. A great many trees have been planted within the last few years, but few have grown. I am hoping that they can yet be grown successfully, but it is doubtful. I think the trees will bear best on their own stocks as standards. I had thirty varieties on the quince and have lost all.

The Slug.

The slug troubles us very much both on the pear and the cherry. I use air-slacked lime, but I find it is scarcely any use if thrown on in the morning, but if thrown on in the heat of the day it is more effective, especially if there is a little wind blowing to carry the dust through the trees.

Plum Culture.

Plum culture is not profitable in our neighbourhood. The trees apparently get winter-killed and few plums are grown. Hundreds of bushels are brought in every year from other places.

To Mr. Dymond.—The wild plum grows freely with us, but very little attention is paid to it because during the last six or seven years a better quality of plums are brought in so cheaply that it has driven the native plum out of the market. I got some of Glass' Seedling from the Association; it is in nice condition and bloomed last year, but there was no fruit; it has bloomed this year and there are a few plums.

To Mr. Saunders.—I can scarcely give you a list of the varieties which I have known to be winter killed as all, or nearly all, that have been brought in has been killed. The Lombard has been winter killed, but I do not think it was fairly tried, because it was grown on dwarf stock. One gentleman in the neighbourhood had twenty or twenty-five varieties, and I do not think he has half-a-dozen trees to-day. He has cultivated a great many on the common wild plum, but they have all succumbed. The curculio is very troublesome.

[*Mr. Beall.*

Cherries—The Robber Robin.

Cherries can be profitably grown with us if we had no robins, but as the law now stands respecting insectivorous birds, we do not want any cherries. I have, perhaps, thirty or thirty-five trees sufficiently large to produce one or two bushels each, but I never had a gallon of cherries yet. Our section of country is swarming with robins. The finer kinds of cherries cannot be grown successfully in this district. We have two varieties of the common Kentish cherries; the fruits look alike up to a certain stage, but the one kind when perfectly ripe is red, and the other is nearly black. The only insect injurious to the cherry is the slug. There are other birds destructive to the cherries; one a bird which is called the mocking-bird or cat-bird. We have also the cherry-bird, but he does little harm.

Grape Culture.

Many persons have a few grape-vines, and one now has a vineyard of, perhaps, three or four acres. The Clinton, Concord, Delaware and Champion succeed best. We cannot grow grapes profitably for market purposes, or that can be sold in competition with those brought in from the outside. The Concord does not ripen sufficiently early, but people grow them for their own use. They grow best with us on a rich loamy soil with clay subsoil. I am not aware of any person having sold many grapes; a few pounds have been sold at about five cents per pound. The vines are not injured by any disease of root or leaf that I am aware of, nor have we any insect pest; but the robin is troublesome.

Strawberries.

Of strawberries there are about five or six acres in town, but this is not sufficient to supply the local demand. For home consumption the Triumph and the Jocunda are esteemed the most, but few of them are grown. Almost everyone grows the Wilson. The product per acre in a favourable season is about two thousand quarts. They are sold to the middlemen at about eight cents. The robin is destructive to the fruit, and so is the cherry bird and the mocking bird. I never heard of any insect which seriously damages the crops.

Extension of Strawberry Culture.

To Mr. Dymond.—From the soil I think it would be profitable to increase the cultivation of strawberries, not only with us, but as far back as Haliburton, where they can grow a far better sample than we can. We grow a better strawberry than those coming from the front, but ours ripen later, and the further we get back the better we find the fruit, but it is still later. The wild fruit is common, but little of it is gathered.

Raspberries—Blackberries.

Of raspberries the varieties most esteemed are the Philadelphia, Brinckle's Orange, and the Mammoth Cluster. I have not known any varieties winter killed until this past winter, when the Philadelphia and Brinkle's Orange were nearly all killed. About ten cents per quart is realized for the fruit. There is a borer or insect of some kind which gets into the top of the canes. None of the cultivated varieties of blackberry are hardy in our district. Wild blackberries grow abundantly farther north, but not in my immediate neighbourhood. They seem to grow naturally on the granite formation, and there are but few plants within a radius of ten miles of Lindsay. There are two varieties, one with a very long berry, and the other nearly round. Both are varieties of the same species, and there is scarcely any difference in their taste. Their fruit ripens together, some time after the Black Caps. The Kilkenny will grow well, but we get no fruit.

[*Mr. Beall.*]

Currants—The Borer.

Of currants we have the Red Cherry and the White Grape. These are the only ones that I know of. There used to be a smaller kind grown by a few farmers, but those who attempt to grow anything like good fruit adopt either one or other of these two kinds. They are profitable for home consumption or family use, but not for commercial purposes. Almost every person grows them for themselves. When they are sold they realize thirty-five to fifty cents a pail, of about ten quarts, imperial measure. The currant borer is very injurious in some places. I have a walk running through my garden where red and white currants are planted indiscriminately on both sides. These bushes were propagated by myself, and were planted at the same age and taken from the same bed, yet on one side there is scarcely a borer, and on the other the bushes are badly destroyed. On one side I have for several years grown onions, and I use salt upon them very largely. I cannot say whether the salt has protected the currant bushes, I simply mention the fact. The currant worm would do much damage if people did not take care of their bushes, but they are soon destroyed. I am not aware of any other insect injurious to bushes or fruit.

To Mr. Dymond.—I think our district is remarkably favourable to the growth of currants, but there no outside market for them that we are aware of. I have never seen the wild currant growing in my immediate neighbourhood, though I have seen it further south.

Black Currants—The Currant Worm.

To the Chairman.—There are a great many black currant bushes in our district. Every one tries to grow them, but for some years they have not fruited well. I have tried to grow them both in the shade and in the sun, but there is very little difference. A great many persons have destroyed their bushes during the last few years, as they will not take the trouble to cultivate them. I do not know of any soil particularly favourable to their growth, as they will grow in almost any kind of soil. The bushes suffered from the measuring worm some years ago; I have not seen any this year. The price we get for them is generally from ten to fifteen cents per quart. Gooseberries are a profitable crop with us. The Downing is the variety most esteemed by people generally. I grow the English White Smith. The Downing brings from seven to eight cents per quart. I got twelve cents per quart for the White Smith last year. The Downing is always sold very green, but the others I sell when they are nearly ripe. None of the varieties grown by me are subject to mildew, but some persons complain that the Downing is with them. The currant worm is very destructive to the leaves, but it is easily got rid of by attending to it in time. We use hellebore and water, applied with a syringe. I have not heard of a fruit worm which destroys the unripe fruit for some years. I prefer a clay loam for gooseberries, but it requires to be very rich and well drained. I plant my bushes six feet apart. I do not think they should be any closer than that. I never saw a mildewed berry in my garden of the White Smith variety. I have tried none of the thin-skinned varieties. There are several persons growing the White Smith variety in this neighbourhood, and nearly all suffer from mildew more or less, according to the treatment. I think a great deal depends on how the bushes are treated.

Gooseberries—Cranberries—Melons.

To Mr. Dymond.—The region I represent is one in which gooseberries can be grown to great advantage under proper cultivation.

To the Chairman.—I am not aware of cranberries being cultivated in our district, but there is a small quantity of the fruit in its natural state near us. There is a ready sale for the berries, but I cannot give you the price. They are usually marketed at home. Watermelons are not much cultivated with us. There are not sufficient either of them or of muskmelons grown for home use.

[*Mr. Beall.*]

To Mr. Dymond.—I do not know what the reason is, but I think the people have not given the growth of melons the attention which it deserves. I think vegetation is just about as early with us as in Toronto, and we can grow many tender shrubs and flowers which cannot be grown in some places about Toronto, because we generally have plenty of snow to cover them.

Grape Culture.

To the Chairman.—As to grapes, the Delaware, the Concord, the Clinton, the Creveling, the Rogers, numbers Four and Fifteen, and the Champion, have all been grown in our neighbourhood, and have fruited. They do much better than any other varieties that I am aware of. The Concord, the Delaware and the Clinton, ripen the earliest. I do not like the Champion myself, and would not grow it. I agree with previous witnesses as to the pruning of grapes. I think they should be pruned in the fall and then pinched in the summer. I agree with the evidence of Mr. Dempsey with regard to strawberries and raspberries.

The witness was then questioned as to bee farming. His evidence on that subject will be found elsewhere. He was then examined as to Forestry and Tree Planting.

The Woods of the District.

To the Chairman.—I think in the counties of South Victoria, Peterboro', and East and West Durham, the proportion of land under original bush would be about one-fifth. I am not aware of any considerable portion being under second growth. The following trees grow in our district: oak, elm, ash, butternut, cherry, maple, beech, basswood, birch, larch, willow and ironwood. Sumach grows as a shrub, but it is not common. We have also the pine, hemlock and cedar. We have a large quantity of cedar, some hemlock, and not much pine. Some hardwood is shipped from the district principally in the form of lumber. Very little hardwood timber is shipped from there.

Economical Uses of Woods.

There has not been much hardwood used for the interiors of houses until within the last few years, but now it is used largely for that purpose, especially maple, cherry, and birch. Red birch is very easily worked. It and maple make a very pretty floor if laid alternately. For ordinary joiner work a great many persons have been introducing ash, and also larch to some extent. For the manufacture of agricultural implements oak, elm, birch and maple are chiefly used. The oak, elm, birch and maple are the most valuable of our native woods. Hickory is used in the manufacture of vehicles, but it does not grow in our district. Basswood, until lately, has been largely used in buggy making, but it is not so much used since the introduction of bent wood for the bodies of buggies. For cabinet making walnut, oak, elm, butternut, cherry, birch, pine, maple and ash, are all used. The price of lumber varies from twelve to twenty dollars per thousand. There is a large quantity of red oak grown with us, but it is not used so much perhaps as it ought to be. We can get a good sample for fifteen dollars a thousand. Nothing is being done with the soft woods for the manufacture of paper. A few years ago there was a factory in operation, and basswood was used to a considerable extent. I am not aware that poplar was used, although it is grown there. Basswood and cedar are both largely used in canoe building. There is a little charcoal made in our district, but not much. Oak staves are in very little demand, and few are made. For railway ties cedar, hemlock and tamarack are used, and the price varies from fifteen to twenty cents, and in some cases a larger amount for extra good ones.

[*Mr. Beall.*]

Planting the Black Walnut.

I would consider black walnut the most valuable of all trees for forest planting. I know it will grow and succeed in this district. I do not know of any person who has grown it or attempted to do so but myself. I have about fifty very fine trees. I have some that will measure from six to seven inches in diameter, and are about twenty feet high. I have grown them from nuts planted in 1866. I know of no tree that will grow so easily, so rapidly and with so little trouble. The trees I mention are bearing nuts now, and I think I observed nuts on them five years ago. Almost all our native trees can be grown successfully and with very little trouble. Our poor lands consist of two kinds. We have none in the immediate neighbourhood of Lindsay, but in these counties we have swamp land and rocky land. On the rocky land the pine, spruce and cedar can be successfully grown, and tamarack and black ash can be grown on the marshy land.

The Spruces.

By spruce I mean the kind that is called the Canadian or black spruce. It varies much in colour. I bought a thousand plants of Canadian spruce a few years ago. I consider it superior to the Norway spruce because it is equally as pretty in shape and it has a better colour. With the Canadian spruce we can get almost every variety of shade, but the Norway is all one shade. I suppose the different shades are all of the one variety but they differ during their life. They can be cultivated successfully in rows, with the branches interlocking in the way described by Mr. Beadle. I have a fine close cut spruce hedge about five feet high, pyramidal in shape, and five feet across at the base. It can be pruned beautifully, and we have now every shade and colour, from the palest yellow to the deepest green. It does not grow so fast in the open ground as the Norway spruce, though I have trees planted twelve years ago, off which I cut the tops five years ago, and they are now eighteen or twenty feet high. I do not know how the Canadian spruce compares with the Norway spruce in merchantable value. It will grow almost anywhere. I would plant it along with cedar or pine on side hills or rocky places.

Plans for Tree Planting.

To the Chairman.—I cannot suggest any plan for the extension of forest tree planting. There will be a disposition to cultivate it when the farmer finds there is money in it. I have a good many trees growing natural in my own grove, that is, I did not sow the seeds, they came up and I took care of them. I cannot speak as to the effects of leaving belts of woods as screens on farms, as I do not know that we have any in our neighbourhood. I know of trees being planted for roadside ornament; it is done as private enterprise.

To Mr. Dymond.—Farmers generally in my neighbourhood denude their land of trees with the exception of a small patch left for firewood. The hardwood in the back country is largely used for timber and cordwood.

A Market for Hardwood.

A good market is being created for Canadian hardwoods. In my younger days hardwood lumber could not be sold at any price; now it can be sold readily at fair prices, about the same as those realized for pine. There is a good deal of hardwood along the line of the Victoria Railway.

Street and Ornamental Tree Planting.

To the Chairman.—I would recommend trees planted on the streets to be placed about forty feet apart; they are generally planted too close together. On roads I would plant them still farther apart. One of the best shaded roads I know of in Canada is the concession line a mile and a quarter north of Brooklin, County of Ontario, about three

miles long. It is lined on both sides the whole way with trees, principally maples. When they were planted, say from ten to forty years ago, they were planted too near together, and since that time many of the trees have been cut out, and still they are too close together. Many persons are planting trees in the fence corners along the roadside. The trees are generally obtained from their own woods.

To Mr. Dymond.—If a man had five or six acres of beech or maple woods from which the cattle had been excluded for a few years, he could get trees enough from it to plant half of a township, and if an arrangement of some kind was made between the farmers and their municipal councils the township roads could be planted at a cost which could scarcely be felt; but trees cannot be planted under present arrangements at two or three cents apiece, as mentioned by a former witness.

To the Chairman.—If a man plants twenty trees in a day after they are brought to him he will do an exceedingly good day's work. The statement made by Mr. Beadle with regard to the number of trees which could be planted in a day may be true of his neighbourhood, but it is not of ours, as the soil is different. We have only a few inches of vegetable loam and below it we have hard gravelly clay, so unless the trees were properly planted they would have hard work to grow. Trees for planting around buildings should correspond with the style of the buildings themselves. If a man has a fine gothic house he should plant a different class of trees from what should be planted near an Italian villa, though I should say in the first place that any trees are better than no trees. Any of our native trees will grow readily if properly planted, and if it were thought proper horse-chestnuts might be planted. I would have some European varieties, such as the oak, ash and elm, and also the cut-leaved birch.

To Mr. Dymond.—Our soil is rather a heavy clay, and generally before planting the trees I would have the ground well pulverized.

To the Chairman.—I would give a prominent place to the native spruce. We should not forget our native pine, for there is no more beautiful tree we can have, if taken from the woods when very young. Our townships give no encouragement to the planting of trees. I would give fifty per cent. more for a hundred acre farm with sufficient trees planted upon it for shelter than I would for the same farm without the trees. For screens for orchard purposes I would use a strip of land from ten to twenty feet wide. For a shelter screen I place first a row of spruces and six feet from that another row, planting the second row so that the trees should come intermediate as regards the first row. Just beyond that I would place some of our ordinary trees such as walnuts, maples, ironwoods and so forth. I think that makes a very effective shelter belt. The hardwood trees do not interfere with the growth of the others. They always keep above them, and in my screens they are growing together without injuring one another. They have been growing for about twelve years and are now about twenty feet high, though I cut off the tops some six years ago.

THOS. BEALL.

The Commission then adjourned until 7.30 p.m.

MR. CHARLES ARNOLD'S EVIDENCE,

Upon resuming, Mr. CHARLES ARNOLD, of Paris, was called and examined.

FRUIT GROWING IN THE PARIS DISTRICT.

To the Chairman.—As far as growing fruit is concerned I am tolerably well acquainted with the section of country twenty miles west of Paris, ten or fifteen miles south, and ten miles north and east, say an area twenty miles square from Paris. I have been engaged in fruit culture upwards of thirty years. All the ordinary fruits that have been named are grown in the district I represent, though peaches are grown on a small scale and some varieties of cherries and blackberries have not been a success. Of the

fruits cultivated, apples stand first. Plum trees are successfully cultivated and fruit well when not injured by the curculio. We have been suffering from its effects for a number of years. Of the total area under fruit culture perhaps two-thirds is growing apples and one-third all other fruits. I should think that one-half of the area planted in orchards is producing fruit.

How and Where to Plant Orchards.

There are a great many trees being planted out every year, but what from bad planting and from purchasing trees from irresponsible men, at least one-half of those planted die every year. The area covered by fruit is constantly enlarging, though not so rapidly as in some other sections. I could only guess at the quantity of apples produced in that district each year. I should say there are ten times as many winter apples produced as summer and fall apples. For an apple orchard I prefer a soil that is neither too strong a clay nor too light a sand, with, if possible, a mixture of limestone; the soil to be well drained. As to the difference between clay soil and sandy soil I find that those who live on a clayey soil call everybody else's sand and *vice versa*. I like a sufficient amount of sand so that it will not bake like brick, and enough clay so that the moisture will not leach through. A peach orchard I say most decidedly should face the north. For grapes a southern aspect is preferable. For an apple orchard, and especially for early apples, I would say face the south. I would prefer a slightly sloping plain. As to the distance between the trees, that would depend upon the kind of the trees, as some spread more than others. If I were planting an apple orchard alone I would plant twenty-five or thirty feet apart for most varieties. For standard pears I would plant about fifteen feet apart. I have never seen pear trees live long enough to spread more than eight or ten feet. Twelve feet is abundant space for plums, though there is a difference in the varieties. Cherry trees on Mahaleb stock should, I think, be planted twenty feet apart.

Varieties of Apples.

For an early dessert apple I would take the Summer Rose, and next to it the Early Strawberry. The Benoni would come third, and then Pomme Royal, which is a very fine dessert apple. For an early cooking apple I would take the Red Astrachan. There are very few of these that come to market as such, except the Red Astrachan. I have frequently sent the Early Strawberry and Benoni to Hamilton at two dollars and fifty cents, and have got a telegram saying "send on all of those little red apples that you have got." The Red Astrachan brings sometimes one dollar a bushel. It generally sells from that downwards. The local demand is sufficient to consume all the early summer apples. I do not believe that any of the fall apples are profitable, because there is not sufficient to ship and there is not enough demand at home to consume them. There are too many grown. If there were twenty times as many grown so that you could ship to Montreal or Manitoba, they would be profitable. The fall apples I esteem most highly are the Graffenstein, the Pomme Royal, the Ribstone Pippin and Cox's Orange Pippin. I esteem the Ribstone Pippin because of the prejudice in the Old Country in its favour. We grow it successfully and it crops well. There is also the St. Lawrence. The Duchess of Oldenburgh is not in favour with us because there are so many better. I should be sorry to be without the Hawley, because it is a splendid apple for cooking and dessert. Fall apples do not realize anything. If I could raise say ten barrels I could realize upon them, but, as it is, no one has more than a barrel or two, and half the time they are allowed to lie on the ground and rot. I think all the fall apples I have named are hardy varieties. I have never shipped any fall apples to Montreal. Of winter apples, as a grower, I esteem most highly those which are most profitable to cultivate in the district.

What Apples to Ship.

In order to answer the question specifically I would wish to know where I was to ship the apples and what were the tastes of the people to whom they were to be shipped.

[*Mr. Arnold.*]

If I were to ship to London, England, I would send samples from which they might choose, and if I were shipping to Scotland I would expect to send different varieties from those that would be popular in England. For the home market the varieties most profitable are, first the Wagner and the Northern Spy. For early winter I should have mentioned the Fameuse. The Ribstone Pippin would be another. Later in the season there would be the Gold Russet. and the Roxbury Russet. I would not like to leave out the Baldwin, though I think it is a poor apple. I would also include Grimes' Golden. There has been no demand for the Greening lately. The Spitzenberg succeeds well in some localities. For export the Wagner comes first; a gentleman in Seaforth told me that he got twenty-nine shillings for them in the old country market, when he got only nineteen shillings for the Northern Spy. The Northern Spy, the Golden Russet, the Roxbury Russet and the Baldwin are all good exporting apples, and are all much about the same. The Roxbury Russet is generally the best of all keepers, though last year the Golden Russet kept quite as well.

How to Keep Apples in Winter.

The other varieties are good keepers, though they do not keep as long as those I have named. The Fameuse keeps until about Christmas, the Wagner comes in about February or March, and then the Northern Spy, if the skin is not bruised, will keep until May. The Baldwin is a good keeper. For keeping apples in the winter I would advise barelling them and keeping them as near the freezing point as possible, without freezing them. The temperature should be steady. I should think that about three-fourths of our crop is shipped to the foreign market. The average price of winter apples at Paris varies from one to two dollars per barrel.

Local Seedlings—Hybridizing.

I think there are several good seedlings in our district that are not generally known. A Mr. Cowerd, near Brantford, has raised several, but I cannot name them. I have experimented for a number of years in hybridizing apples, and of those I have raised I have five very promising seedlings. I think the Ontario, which was sent out by the Fruit Growers' Association two years ago, has no superior as a cooking or shipping apple. I have kept it as late as the first of July. It is a seedling of the Northern Spy crossed with the Wagner. Of the other four, the one I have called the Dora is a very good dessert apple beautifully marked. Another one, which, at the request of Mr. Downing, of Newburg, I called Arnold's Beauty, is a yellow apple with red cheeks, and is a first-class keeping apple. There is another, called the Ella, which in appearance is very much like the Black Gillyflower. It is not pretty, is a poor grower, but it is a delicious apple. The fourth of my seedlings has never been named or sent out, though Mr. Downing has urged me to send it out, as it is an excellent dessert apple. By Mr. Downing I mean Charles Downing, of Newburg, N.Y., who is considered the best authority on apples and fruits generally in America. I submitted them to him, and he wished me to send him scions. I also sent them to the Royal Horticultural Society of England. The one which the Fruit Growers' Association here pronounced the best, the Royal Horticultural Society would not look at, but they sent me a kind of diploma, and spoke very highly of the other three, that is, the Ella, the Dora, and Arnold's Beauty. They were among the fruits exhibited at the Centennial Exhibition, and I received a medal for the best series of hybrids. Of the standard varieties, which are cultivated elsewhere, but are not reliable in our district, are the Baldwin and the Greening. They are tender, unless worked on other trees.

Blight—Insect Pests.

We have a slight blight on our trees in that district, but it has not been serious. We have also been troubled with the Oyster Shell Bark Louse, but we have no borers. We have no insects on the leaves, and we do not allow the tent caterpillar to trouble

us. The Codlin worm is very destructive. Bands of paper or cotton batting or old cloth, tied around the trunks of the trees, and untied every week or so, are the best means of catching the larvæ and preventing the moths. Generally we take several thicknesses of paper so as to give them a good hiding place. If that remedy was generally adopted by fruit growers I am satisfied the moth could be kept under. It is a blessing for us that some years we have no apples, as then we are able to get rid of the moth. The bandages I have spoken of would need to be examined every week during the summer. I know of no other remedy for them though I have heard of a great many.

Orchard Cultivation.

In the cultivation of apple orchards a considerable amount of common sense and judgment is required. If the orchard is growing too fast I allow the grass to grow around, and when it is growing too slow I immediately dig it up and manure it well. I should be sorry to plant a new orchard without keeping the ground cultivated for four or five years at least. After that the treatment would depend on circumstances, such as the depth, strength and richness of the soil, how soon I would let it get into grass again. I know an orchard remaining in permanent grass for a dry season proves death to many apple trees, because it ceases growing in summer time when it should grow, and when the fall rains come on it makes a start too late in the fall for the wood to ripen and the trees are badly injured. Cider is only made for home consumption in our locality. No particular varieties are cultivated for that purpose. Apples which fall and are found lying under the trees are made into cider. There is no demand for apples other than winter apples, and that is the reason they are grown to such an extent. There would be a market for summer and fall apples if certain varieties which might be shipped to England, Manitoba, or even Montreal and Quebec, were extensively grown. I would not think of growing more summer apples unless I grew a great many so that I could ship. There is nothing in the way of soil or climate, or the possibility of a good market, to prevent us from growing as many as we please.

Choice Apples.

My business is growing all kinds of nursery stock, though I keep specimen trees of the different varieties. The Ribstone Pippin is cultivated to suit the taste of the English, as it is a favourite apple there. Every Englishman and most Scotchmen think there is nothing like it. I think it enjoys rather a false popularity in those countries. It is not a first-class grower. It would of course be a profitable apple here if we had a market in England. We can grow far better Ribstones than they can in England, owing to our having a better climate. In some localities the Ribstone Pippin is a shy bearer, though nothing like some other varieties. I have some half-dozen Ribstone Pippins bearing, but they are youngish trees. With regard to the Ontario apple, the characteristics of the fruit strongly resemble those of the Northern Spy. On the blossom end it is very like the Northern Spy, and on the other it has a strong resemblance to the Wagener. It is about the size of the Spy, but flatter and slightly more acid. It is a beautiful red apple, but too tart to suit me. It would not be used in England for a dessert apple as it is too large. It is a good cooking apple. I have never shipped apples to England except such as I have sent to ascertain the taste of the people. I have not tested the Ontario in the English market because there is only one bearing tree in existence. Assuming that it can be sent in sufficient quantity I should think it would be a profitable apple because it is superior to the Baldwin, which is perhaps the most profitable of all apples to ship. I think it is a good apple and will compare favourably with the very best, but I expect to get better apples than it is. I am satisfied as to its bearing qualities as it has borne well every year. I think in some of the English markets Canadian apples have taken the preference. They are recognized as Canadian as against American apples. Americans have injured us by calling all poor

[*Mr. Arnold.*]

apples from America, Canadian apples, and all good apples from Canada, American apples. The Newtown Pippin is an American apple which has almost gone out of fashion in England for several reasons. In the first place you scarcely find two men who agree as to which is the Newtown Pippin. Many are shipped to England under that name which are nothing but Greenings, and you will see the same confusion at all our exhibitions.

English Taste.

A dessert apple which would take the English market should be of medium size, very pretty, and, at the same time, possessing a good flavour. I have Grimes' Golden. It is a yellow apple and would take the English market. The common people of England who buy apples for cooking purposes want a red apple. I have not an apple which comes exactly up to the standard I have described for the English market. There is something yet to be done in order to strike that particular want. Cox's Orange Pippin which I mentioned is a very fine apple, of excellent flavour, and though it is not quite bright enough, is suitable for the English market.

Pear Culture.

The most successful variety of pear, everything considered, is the Bartlett. There is more satisfaction in growing it than any other. Clapp's Favourite strongly resembles the Bartlett, and is a little earlier but not so reliable. The Shelden is a first-class pear. The Beurre D'Anjou for a later pear is very good. The Tyson is equal in flavour to the Seckle, which is a very fine pear. The Goodall is a recent pear which is likely to become popular. The Flemish Beauty succeeds well in some localities. Pears have to be shipped from our neighbourhood to pay, and these pears will not carry far. I do not think pear culture has ever been made very profitable with us, and it is certainly not at all equal to apple culture in that respect. I have never grown pear stock myself fit to work, but I have imported wild Scotch pear stock and all pears have succeeded admirably with it. We should work our pears on some wild hardy stock. I would much prefer working it on quince stock, budding low and planting the pear down below the surface so that the tree begins to bear immediately, and yet throws out roots from the pear stock which become standard trees. I would rather take such a tree than a pear worked on poor pear stock. By poor stock I mean lacking any hardihood. They have not the hardy character of the wild Scotch or French pear. They are not reliable; first, because, of seedlings, no two are alike in robustness of character. You may get one good one and ten bad, while if they are grown from quince stock they are all alike. I am satisfied that the stock exercises a great influence over the tree that it is grafted on, and also upon the fruit. If the Duchess D'Angouleme is worked on pear stock it would scarcely be known, but if worked on quince stock it is three or four times the size and better in flavour. The Seckle will not grow on quince stock, and the only way to grow it is to graft it on good healthy pear stock. The average price per bushel realized for pears is about a dollar and a half. All varieties of pears are subject to blight. The Seckle and the Tyson are less subject to blight than any I have in my grounds, but I would not like to say that they would resist it. The slug on the leaf is occasionally bad but it is not hard to get rid of. Ripening pears should be kept in a cool place, and, if pear growing is made a business of, there should be a room for the purpose. I would not allow them to ripen on the tree. I would pick them when they had attained their growth. You can tell when they are full size by lifting them up by the finger. If they cling to the branch it is best to let them remain for a while. I would keep them in a cool place, but if I wanted to get the highest flavour I would put them in a warmer room a few days before I wanted to use them. I do not think it requires any light to keep them.

[*Mr. Arnold.*]

Cause of Blight.

To Mr. Dymond.—I have no theory as to the cause of the blight. I have sometimes thought that blight was much like apoplexy in the animal. The blight generally comes on my orchard after a severe or sudden change, such as a heavy wind, which knocks the branches together and breaks the sap vessels. I am satisfied that high food is also one cause of it. Pears which grow slowly in a moderately rich soil, are not so subject to it as those which grow in a very rich soil. Many of the English trees are very unhealthy. Sometimes the trees recover from blight, and sometimes they do not. Some varieties are subject to be killed.

Plum Culture.

Plums are grown in our district. The curculio is a perfect pest, and affects the question of profitable plum growing a good deal. I have got some three thousand curculios from about fifty trees, and, of course, if my neighbour has fifty plum trees, and has no shaking to do, his profit will be greater than mine. My plum trees cost me more every year than the fruit amounts to. I grow the Prince's Yellow Gage, Pond's Seedling, the Green Gage and the Columbia. All the better sorts thrive with us. I have the Lombard plum, and although it fetches a lower price than others, it is as profitable as any. Pond's Seedling will bring twice the price of the Lombard, but it does not produce half the crop. There are very few plums shipped. We generally get from one dollar to one dollar and a half for the Lombard, and three dollars or four dollars for fine plums, such as the Washington or Pond's Seedling. Sometimes the crop is badly injured by rot. I think the Washington suffers worse from rot than the others. Any tree in which the plums are thick and touch each other will suffer from rot. It comes principally, I think, from showery weather, followed by warm sunshine, especially if the wind knocks the plums together, causes them to bruise and then mortification or something of that kind sets in. I do not know of any plum seedlings which deserve to be better known.

The Robber Robin—The Cherry Bird.

The robins are a perfect pest. They will take anything and everything, including plums. We] use no special manure in growing plums. The robins are most destructive from the first ripening of the earliest cherry until November. They steal all the grapes and then they clear out. I have a tree of the Early May cherry which is at this moment literally covered with cherry stones, with not a particle of flesh on them. The robins and cherry birds have cleaned it. The cherry bird is also an unmitigated nuisance. I have known the robin to eat ground worms, but I never knew him to eat the curculio or the cabbage worm, or anything of that kind. He is carefully protected by law, but in self-defence I am compelled to shoot him on my own grounds. With regard to the native plum of which Mr. Beall spoke, my idea is that where we have such a fruit and can get superior varieties from other countries, we can model the fruit just exactly to what we want.

How to Obtain New Sorts.

By taking our wild plum and crossing it with our best varieties, we will, in course of time, get a plum, which, in colour, shape, and every other respect, will be best adapted to our climate. I am too old a man to begin that work now, but if I was as young as the chairman I should make the attempt. Results could be easily obtained in eight years, that is, you would then get the first crop, and, from that time you could proceed and get still nearer the ideal fruit. You would likely have to cross one hundred plums, all different in character; some will partake of the character of the male and some of the female. The Dawson plum, of which Mr. Dempsey spoke, is not free from the curculio in our district. It is an extremely prolific plum.

[*Mr. Arnold.*]

Cherry Culture—Varieties.

We grow the principal varieties of cherries in our district, and find them profitable. The Elton is the variety of cherry which everybody should cultivate, as it succeeds well. All varieties, I might almost say, succeed on the Mahaleb stock, and it is very rarely that we can get any cherry to succeed on the Mazzard stocks. The Mahaleb has a little bitter fruit called the bird cherry, which grows in France and England. The Mazzard is, I suppose, the original of the class of that name. I do not know whether it belongs to the Bigarreaus or to the Hearts. Mazzards are tender in most places, and are very often unreliable, simply because Mazzard seedlings seldom turn out two alike. Some will stand the winter and some will not. The Mahalebs are called dwarfs, although they grow quite as high and as rapidly on it as on the Mazzard for a number of years. The Elton is too soft and too good a cherry to ship—too tender in the flesh. It is a constant bearer, and altogether a very fine cherry. The May Duke has not been as great a success with me as with some other people. The Governor Wood is a fine white-fleshed cherry. The Black Tartarean is a beautiful cherry, with fine flesh, though the tree is tender in some localities. The Black Heart is another very fine cherry, the hardiest of all except our old Kentish cherry. Knight's Early Black is another good cherry. All these varieties succeed with me. The Napoleon Bigarreau is a large cherry. There is no profit at all in the common Canadian cherry, because everybody has them, and there is no sale. For the cherries which I ship to Stratford, London, and so forth, I obtain from six to nine cents a quart, that is from the wholesale dealers. They retail at about twelve cents. I do not find that the curculio injures the cherry to any extent, and the fruit is troubled with no other insects. We do not find that the fruit rots much, though that depends a good deal on the sort. Some varieties are more subject to it than others. Those varieties which hang in large clusters are much more subject to it than those growing singly or nearly so. Occasionally the woodpecker takes a few, but it is not so with the robin and the cherry bird. They stay on the trees till they destroy them all, without taking any off. I do not like a very warm, sandy, excitable soil for cherries. A sandy loam, inclined to clay, is best. There was a seedling sent to me some years ago by Mr. Mosely, of Goderich, which he called the Ne Plus Ultra. I thought little of it at the time, but he sent me some grafts afterwards, and the more I saw of it the better I liked it. I believe it is now the most promising one that we have. It does not grow in clusters but grows out of last year's wood in ones and twos. I never knew of any such occurrence in cherry clusters before. They generally grow on spurs. The cherry which we call the Kentish cherry is not indigenous but imported. The Napoleon Bigarreau and the Black Heart are the best for shipment. The Morello is not much grown. It is a fine cherry for preserving, though I do not think it is much better than our Kentish cherry. It grows on almost any soil, but it is not generally cultivated.

To the Hon. Mr. Wood.—For canning and preserving the Napoleon Bigarreau is the best, but the old Kentish cherry is a favourite of mine.

To Mr. Aylsworth.—I never tried the crossing of any of the finer kinds on any of the wild cherries.

Grape Culture.

To the Chairman.—I cultivate grapes considerably. For home consumption and dessert purposes I esteem the Brant, Rogers' Number Three, Rogers' Number Fifteen, and there are a number of Rogers' other seedlings which are very good, all strongly resembling each other. Then there is the Delaware, and the Canada, which is very good on account of its keeping qualities. I have a very high opinion of Burnet's grape from what I have seen of it in other localities. I think the Concord is perhaps the most profitable for market, because the public have little taste, and it looks well. I have raised a good many grapes by hybridization. The Brant is one of my hybrids. Its parents are the Clinton and the Black St. Peter's. I place it first because it is earliest among the frost grape family. The grapes of this family hang until the frost comes, and they are improved rather than injured, while Fox grapes are injured by the frost. I do not think we have

attained anything like perfection in the varieties of grapes which we have now. I am not positive as to whether Canada is likely to be a successful grape growing country, partly owing to the liability to the phylloxera. The ravages of the blue beetle also make it rather discouraging. I am satisfied that first-class wine can be made from the Canadian grown grapes, with the addition of some saccharine matter. There is nothing in the character of the soil or the location of our district to prevent us from growing all these varieties successfully.

Insects, Frosts, Phylloxera, and Blue Flea Beetle.

Insect pests are our only drawbacks. Immense vineyards have been planted out and neglected, so that grapes can be sold at from three to five cents per pound, and then would not pay for the cost of cultivation. There is another discouraging feature, that a man who makes a stuff which he calls wine will sell his fluid in preference to pure grape juice. There is no demand in our district for the grapes grown there we could sell them readily at from three to five cents a pound, but I never offer to sell mine. I make them into wine. At the present prices realized for grapes I do not think their culture is successful, that is for the sale of the grapes. If they could be made into wine, and the wine sold, it might be profitable. The grape vine in our section sometimes suffers from late spring frosts. I have known the Fox grape family to have the flavour taken out by autumn frost. There is a disease affecting my vines which I think is the phylloxera. The roots are injured by something early in the fall, but the insects are so small that I cannot catch them. The young roots look as if the outer skin was all eaten off. I have never endeavoured to find out what the insect was by sending samples of the roots to experts, because I was not suspicious of it before, but I shall do so this fall. There is a sort of rot which affects the fruit, and mildew affects both the leaves and the fruit. The blue flea beetle, which is about one-fourth of an inch long, bores right into the centre of the bud just as it begins to expand in the spring, and the result of its operations is that the leaves never expand. It spreads over the whole vine laying its eggs. The insect lives a considerable part of the summer. This summer, though we had millions of the beetle, there is not a worm to be seen. I think the heavy wind and rain took them all off. They have been very destructive this year in our vicinity. The Clinton has suffered worse than any other. They have been prevalent for years back. They take refuge on the Virginia creepers near my house. The insect is a little steel-blue beetle.

To Mr. Dymond.—The beetle burrows into the bud and lays its eggs in the first place. The buds on the vine come out before those on the Virginia creeper. There would be some hope of destroying them if everybody would take the pains. I have compared the accounts of the operations of the Phylloxera elsewhere with my own experience, and the comparison leads me to believe that the insect to which I have referred is that insect. My crop of grapes under glass is also injured. The phylloxera attacks both root and leaf. It was only last fall when I suspected its presence.

To the Chairman.—There are no other insects which trouble us very seriously. There is a little insect which we find in the seed of the grape. It is found in the Clinton and in some of the others. The robins are particularly destructive to grapes. I have not a favourable word to say for the robin in the way of mitigating circumstances. There are no other birds which injure the grape crop to any extent.

To Mr Dymond.—We have some sparrows, but they have shown no disposition to injury, only in frightening away other little birds.

The Commission then adjourned until Saturday, at 9.30 a.m.

Saturday, June 12th, 9.30 a.m.

MR. AYLSWORTH, Chairman, *pro tem.*

The examination of Mr. ARNOLD was continued.

HYBRID WHEAT.

To Mr. Dymond.—Mr. Bucke was calling my attention to the report of the Commissioner of Agriculture at Washington, in which he says that my Gold Medal wheat is leading to important results there. It was sent out by that Department in 1877. The Commissioner gives reports from twelve States, nine of which speak in the most favourable terms of my hybrid wheat. An Alabama correspondent writes to the Commissioner: "The wheat sent me by the Department possesses value above gold, and an adaptation above any other variety." One from Arkansas reports: "The variety of wheat from the Department yields more and suits this people better than any other ever tried here." From Connecticut: "The wheat sent us by the Department is the best ever raised here." From Pennsylvania: "The wheat sent from the Department has made a decided improvement in the yield and quality of our wheat crop, and has given great satisfaction." The rest are to the same effect. Of course we expect in all crosses that there will be a great number of blanks, so that for one hybrid which may appear to be good, we have to throw a good many useless ones away. Foolishly I let one man and another have some of mine, with the distinct understanding that they were not to be sent out as my hybrids, but, strange to say, nine or ten varieties were sent over the country as Arnold's hybrids. One variety, for which I got the gold medal from the Agricultural Board of Ontario, is a very promising wheat. Another variety, called the Victor, is also an excellent wheat. They are both fall grains. When I first began, the midge was very destructive, and there were certain varieties which were midge proof but of miserable quality, and my idea was to get our old Soule's wheat in midge proof chaff, which I believe I accomplished; but, fortunately for the country, by the time my wheat was ready to introduce, the midge had disappeared everywhere, though I believe it has reappeared since in some localities. I do not know whether my wheat is proof against the rust, as we are not troubled with rust in our vicinity. It has been grown in Canada to a considerable extent and I have received very good reports of it. There is this difficulty in the way, that I never introduced a new grain that there were not a thousand bushels of grain claimed to be mine for every genuine bushel sent out by me. One man acted as my agent, taking so many counties, and I heard of his selling over one thousand bushels. He first got from me samples and circulars and canvassed the district, but never bought a kernel of my wheat to fill his orders. One of the two varieties which has been most successful is called Arnold's Victor, and the other Arnold's Gold Medal. The grain is a fine one, but the ordinary farmer would be able to tell the difference between Soule's wheat and mine if they were placed alongside. It is s very large, fine, plump wheat. A wheat Committee was appointed by the Board of Agriculture of Ontario, consisting of Mr. Christie, Mr. Mills of Hamilton, Mr. Cowan of Waterloo, and others. I have their testimonials, and they awarded me gold medals. I have not a peck of it now. It is completely out of my control. When I first started, many would send directly to me for samples, but you know how gullible people are. I don't know that that wheat is to be had in genuine condition anywhere, and the only way to propagate it extensively would be to begin again with a few heads. Of course I could tell whether they were genuine or not.

HYBRID PEAS.

I have succeeded in crossing peas. I have only made attempts at crossing garden peas. The Champion of England is the highest favourite of all peas, but it requires sticks. McLean's Little Gem is a fine dwarf, and I crossed the two, and I claim to have got all the good qualities of the former on the stock of the dwarf. Bliss & Son, of New York,

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bought the whole stock of me, and sent it out as Bliss' American Wonder. It is now known by that name all over the continent. I have been offered sixteen dollars a bushel by parties in New York and Philadelphia. I sold my rights to them with the view of their controlling the whole product. It does not grow as a field pea. It is the earliest of all peas. It has four qualities especially commending it. First, its earliness; second, its productiveness; third, its dwarf habit; and fourth, its high flavour. I am still engaged in crossing peas.

Strawberry Culture.

To the Chairman.—Strawberries are cultivated considerably in our district. I should think that there is about one-eighth of the land covered with strawberries that there is with apples. For home consumption it is very hard to say which varieties are most esteemed, as you cannot get two persons to agree. The Triumph de Gand and the Jucunda are favourites with some. A small berry called the Mary Fletcher has the highest flavour of all, but is not so productive. The most profitable for the market is Wilson's Albany, and though there is one called the Ida, which is very productive and is a larger, finer and brighter berry, Wilson's Albany carries the best of any. Next to it I would place one called the Alpha. It is a splendid bearer and very early. They should always be picked in pint or quart boxes, then packed away in crates. In favourable seasons the usual product is seventy-five bushels per acre, though I have grown as high as three hundred bushels. The price is going down every year. I contracted with a man in Seaforth at seven and a half cents, delivered there, which would be about six cents. The robins and the cherry bird are very destructive to the strawberry, and there are several insects which seriously damage the crop. There is one that burrows into the collar or stock, and you find it riddled through and through. It is a little flesh-coloured worm, and it destroys whole beds. The large white grub will sometimes follow a row of new planted strawberries. They are the larvæ of the May beetle. There are other insects, but these are the only ones that seriously injure the plants.

To Mr. Dymond.—For the earliest berries sandy soil is preferable but it is objectionable in some respects. It is difficult to keep the berries out of the sand. They will dry up quicker on dry sand. It is an advantage to have two or three different kinds of light soil for early berries. The only way to raise strawberries is to cover with straw in the fall, and rake them over in the spring. The straw then gets under the stems. I have made experiments in crossing strawberries. I have sent out four this year. At the request of Mr. Downing, of Newburg, I have named one the Bright Ida, another the Alpha, another the Maggie and another Arnold's Pride. Arnold's Pride is rather inclined to be late.

Raspberries.

To the Chairman.—The Philadelphia is the leading market variety of raspberry. The Mammoth Cluster is the best of the blackberries; some hybrids of Mr. Saunders' are quite superior to them all. They are crosses between the red and black, and are very productive and hardy. The flavour is between the two. Mr. Saunders' hybrids are getting to take the lead in that class. The two kinds I have mentioned are the hardiest, though there are some that are better flavoured, such as Brinkle's Orange, the Antwerp, the Belle de Fontenay and the Diadem. The culture of garden raspberries is not profitable in our section, and never will be as long as there are so many wild ones brought in from the country. We can find a market for a few at about ten cents per quart. There are some insects that bore into the cane, but I think they are not very injurious. The raspberry saw-fly has not done very much damage to us.

Hybridizing Raspberries—Currants.

To Mr. Dymond.—I have made some experiments in hybridizing raspberries. I have really only two that are going to amount to anything. One is the Diadem and the other

Number Ten. They were crosses in the first place between the European raspberries of different kinds, and the White Cap. The cross is one very difficult to make, and my final aim was to produce ever-bearing raspberries. Number Ten bears immense crops in the fall, but they are of no value, because there is then generally an abundance of other fruits, and they seem out of season. The Black Cap, of course, is not a raspberry, it is a bramble. One throws out suckers from the roots and the other takes root from the tips of the cane. The crossing of two distinct species I call hybridizing, and the crossing of varieties of the same species, I call mere crossing. The colour of Mr. Saunders' hybrid is not very attractive, but rather dirty looking, and that militates against it in the market. None of the cultivated varieties of blackberries are hardy in our district. There is a new variety called the Thornless Blackberry, but so far it has been worthless. I am crossing it. Of white currants there is nothing equal to the White Grape, and of red currants the Cherry Currant takes the lead for size and productiveness. The Victoria is a better currant than the Cherry in point of flavour. Currant culture is not profitable with us. The price obtained is usually six cents for the red and white currants. The black currant is not much cultivated for the market with us. There is very little difference in the varieties. If the best varieties are poorly cultivated there is very little difference between them and the common varieties. Lee's Prolific and the Black Grape are perhaps the best, though Mr. Saunders has a cross which is the finest grower of the lot, is very productive, and a large size. The culture of this fruit is not profitable with us. The bushes suffer less from insect enemies than any other currants.

Forestry—Tree Planting.

To the Chairman.—I may say there is little original bush left standing around Paris, at least there is not over an acre to every one hundred acres. The land has nearly all been cleared. Taking in the Indian reservations, swamps, side hills, and so forth, there might be, perhaps, four acres to the one hundred acres within a radius of ten miles. By second growth I understand the timber which has sprouted up from the stump of the tree that is cut down, and the reason of this rapid growth and better timber is because the whole strength of the root of the tree is thrown into the suckling. I do not think there has been any planted after the removal of the original timber. There is no re-planting or second growth of the kind which springs up spontaneously and not from the roots of the trees. We have no considerable quantity of wood in our district suitable for economical purposes. For shade and ornamental purposes a good many trees have been left on farms. It is quite common to leave three or four trees on every field. Farmers find it a considerable advantage. For forest planting, for economic purposes, I should prefer the black walnut, the butternut, the hickory, and the basswood, and I think it would be wise to plant oaks sooner or later. The ash is a rapid growing tree, and the elm is also a good tree. Maples may be planted for fuel. On very poor lands, the larch and the cottonwood, or abele, would succeed best. It will grow anywhere and grows very rapidly. The wood of this tree is used for making butter bowls and utensils of that kind. For land which is unproductive for agricultural purposes I would recommend this cottonwood, but if the soil is at all good I would advise the planting of walnut and the other trees I have mentioned. The only way in which to encourage people to plant forest trees is to convince them that it is for their benefit to do so. For hill sides and other such places that cannot be cultivated I would recommend the walnut, butternut, hickory and basswood. I cannot recommend any plan for the encouragement of forest tree planting other than the one I have mentioned. No one in our neighbourhood has planted any young forests.

Transplanting Trees.

Unless trees have been prepared by transplantation; the smaller they are planted the better. They should not be over a foot high unless they have been so prepared. After they are planted I would cultivate the soil the same as for corn or potatoes. I would plant the trees at first with a view to thinning them out. As to the cost per acre, the

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small trees could be supplied for five dollars per hundred. The planting would be about five dollars per hundred, that is, for nurseryman's trees, about one and a half feet high. I would not recommend the planting of such small trees, but I would have them properly prepared to plant when they were two or three feet high. They would then cost about twenty dollars a hundred when planted. Some varieties of oaks, walnuts, etc., could be raised from the seed by farmers if they attended to the matter, but I find it more profitable for me to send and buy my trees one or two years old from those who make a business of planting them. The raising of forest trees from seedlings is a business by itself. It would pay better to import some from France and England than to grow them, as they have to be shaded. Young trees should be grown in a seed bed before being planted out about two years, and then should be re-transplanted every two years until they are put where they are to remain.

Pruning and Moving Trees.

To Mr. Dymond.—We prune the roots with a spade. In the case of trees which have not been transplanted, and trees, say four, five or six feet high, which have not been moved lately, we send out a man in the spring to cut off the roots about a foot from the stem. In the fall in digging them up you will find abundance of fibres, and unless this is done it is dangerous to remove them at that age. If people transplanting from the forest, would go about this time and cut off the roots a few inches from the stalk and go next year and dig them up they would find no difficulty. In moving trees it is better to cut off the tap roots. For instance, in growing peaches it is the practice of many to put peach seeds in sand in the greenhouse until they germinate. There is a long tap root which we pinch off, and when we take it up afterwards we find a mass of fibres. In fact the tap root is not essential to the future growth of the tree.

To the Chairman.—As to the branches, I would not touch them until I came to transplant. When we dig them up we have to cut off a portion of the roots, and it is necessary to take off about the same proportion of the branches. The root vessels cannot draw sap enough to supply all the leaves unless this is done. The reason I would give for pruning with a spade is, first, that it prevents injury to the root while the tree is being finally moved; second, it produces large growth of small fibrous roots within a limited space, and this adds to the nourishment of the tree.

Orchard Screens—Shade Trees.

For screens for orchards, the Norway spruce is the finest tree for shelter. It will grow on every variety of soil. The width of the belt, or the size of the screen would have to determine to a certain extent what others you want to plant. If it is only a small ground you would not want to take up a rod or two all around. If it is much larger, I should say plant two or three rows of trees. A row of maples inside a row of walnuts and a row or two of Norway spruce, or you might take a row of Scotch pine, a row of spruce, and a row of maples. Each row might be planted twelve feet apart every way. It would depend upon the amount of cultivation to say what time would be required to make such a screen effective. With the Norway spruce, after the first year's planting, they will average one foot to eighteen inches a year, and in ten years you would have a tree at least fifteen feet higher than the one you planted. As to the probable cost of such a screen, I have given you the cost of forest trees, and it would amount to about the same thing. For planting around fields or on public roads I have supplied some stock growers with tall apple trees to plant in their fields out of the reach of their cattle, but how they succeeded I cannot say, but I cannot see why tall growing apple trees should not be planted for shelter just the same as others. For shade trees in clumps, the maple, the horse-chestnut, the basswood and the elm are all good. As to the kind of trees that should be planted for shade in cities, villages and towns, it depends a great deal on the soil. A great deal of maple is planted every year, that is around towns and cities. Where they are planted on stony

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banks they only last one or two years. The only tree which I know of that would succeed on such land is the cottonwood, and it ought not to be there. Where the soil is richer, there is no better tree than the soft or hard maple. The European sycamore is also a pretty tree, and it is also often planted. As to the distance apart at which they should be planted, I could not answer exactly, as it depends on the width of the street and other circumstances. For ornament, in the neighbourhood of buildings, the mountain ash and the horse-chestnut would grow in almost any part of the country. The cut-leaved weeping birch, and probably the beech, would also be suitable. Of evergreens, I would take the Austrian pine, the native black and white spruce, the Norway spruce and the dwarf mountain pine. They would succeed everywhere. There has been no re-planting that has had an effect on the rainfall that I am aware of; but I am convinced that clearing the forests has been very detrimental to the rainfall. When I was a boy our rivers used to have abundance of water in June, and now they have not half the quantity. I am satisfied that this condition is caused by the clearing of the forests. I hope some effort will be made towards second planting for that purpose if for no other. Our township has given no encouragement towards the planting of trees, and pathmasters keep constantly cutting them down every year in the townships of our district. As to the value, comparatively, of a 100 hundred acre farm with or without sufficient tree shelter, I would certainly think that if sufficient trees were planted it would enhance its value.

To Mr. Dymond.—I do not employ travellers to sell my trees. I have been very unfortunate with them, as they have been dishonest to me and the public too. In the United States they hold out inducements for tree planting, by saying, "If you plant so many trees we will allow you so much off the cost of your land." That is, in selling wild land they make a reduction.

CHARLES ARNOLD.

MR. P. E. BUCKE'S EVIDENCE.

P. E. Bucke, of Ottawa, was called and examined.

Fruit in the Ottawa District.

To the Chairman.—I reside in Ottawa. I am acquainted with the Ottawa district. I have some knowledge of fruit culture. We cultivate a few varieties of apples, raspberries, strawberries, gooseberries, and small fruits generally, including grapes, are also cultivated. There are very few plums. Of the cultivated varieties grown in my district there are more strawberries than any other fruit cultivated. I know of no one who goes into orcharding as a business. I do not think one-half of the apple trees planted are in full bearing. Before the Government was removed to Ottawa there was hardly any fruit grown at all, in fact the people did not know what fruit culture was, but when the seat of Government was fixed at Ottawa there was a demand for it, and people began to cultivate fruit for home consumption. We do not grow near enough of any kind to supply the district. I think this year there will be nearly enough strawberries for the demand. They succeed best on any land where there is good drainage. The average price for summer apples is $2.50 per barrel. The local demand is more than sufficient to consume all the summer apples grown in the neighbourhood. The varieties grown are the Alexander, the Tollman's Sweet, the Duchess of Oldenburg, and the Red Astrachan. The most common variety is the Duchess of Oldenburg, which is there considered a fall apple. The average price realized per barrel for fall apples is about $2.50. The present supply of fall apples is not equal to the demand. We import our winter apples. The average price for winter apples is from $3 to $3.50 per barrel. We have a seedling called the Gatineau Belle. It is an autumn apple, not a first-class fruit, but

the tree is very hardy. It ripens in September. Apple trees are subject to sun-scald, which is about the only disease we have. The trunk of the tree turns black. The borers are very destructive. The tent caterpillar would be injurious to the foliage if not looked after. The codlin moth is very injurious to both crabs and apples. We do not use any remedies.

Apples not always successful.

To Mr. Dymond.—As far as my experience goes, apples do not appear to succeed, the winter is too severe. The Red Astrachan, the Duchess of Oldenburg, and the Alexander appear to be the hardiest, but I do not think you could raise an orchard of them. The highest ground you can get is apparently the best situation for the cultivation of apples. I cannot tell the reason, unless it is perhaps that the early spring frosts do not attack the high ground as much as the low. Nothing has been done in the way of planting wind breaks as a shelter for apple orchards. Several have tried orcharding to the extent of planting about one or two acres. Mr. Keefer has an orchard situated below New Edinburgh, and Mr. Haycock has one on the north side of the Ottawa River. The soil of Mr. Keefer's orchard is a sandy loam on the top of limestone. The other is a light gravelly soil. The subsoil of Mr. Keefer's land is lime rock. It is well situated for drainage, and the other did not require any. The most successful orchard I know of is planted on a gravelly hill about two miles from the city. It contains two acres, and, I think, has been planted eight years. The trees are just coming into good bearing. It has been so far successful, but it is only a small knoll. The conditions appear to be exceptionally favourable. The Hon. R. W. Scott has tried apple growing. He grows the Red Astrachan and the Duchess of Oldenburg on his farm about three miles out of the city, and he has succeeded pretty well. He plants evergreens along with the trees, and I think they protect them. The trees have been planted ten or twelve years. The land is on a limestone bed, and his experiment has been measurably successful. Both Mr. Haycock and Mr. Keefer have been unsuccessful. I am one of the Directors of the Fruit Growers' Association of Ontario, and I am in communication with persons throughout the district with a view to further experiments in fruit growing. The Gatineau Belle apple is generally supposed to have grown from some seed dropped by people who came from the old country. In colour it is a darkish muddy looking red, and it is very productive. It is more of an eating than a cooking apple. It ripens in September and is of medium size. It would not keep long. I think it might be grown pretty successfully if the borers were kept out of the trees. It is not sold at all by the barrel. I have grown some seedlings, but I have none of importance or value. I am Director of the Fruit Growers' Association for District number Two, which comprises Lanark, Renfrew, the City of Ottawa, Carleton, and Russell, and my remarks apply pretty well to the whole of that district.

Pears not successful.

To the Chairman.—Pears cannot be successfully grown in our district, neither can we grow successfully any of the cultivated varieties of plums, the tree of Glass' seedling appears to be very hardy, but we cannot yet tell whether the fruit spurs will stand the frost.

Plums—Peaches—Cherries.

To Mr. Dymond.—We have a plum called the Greenfield; it is said to be a seedling of the Magnum Bonum. It is a fine large plum, and the tree is the hardiest that I know of. It was raised in Russell County, and so far has answered exceedingly well, and will I think stand the climate of the North-West. It is being propagated by Mr. Gildersleve, of Guelph, and has already been sent for trial to Manitoba. We have never tried to cross the wild plum with the cultivated varieties. Any attempts made in the

direction suggested by Mr. Arnold as to getting a good hardy variety of plum in this way would have to be made in the western part of Ontario, because we cannot obtain the blossoms so far east as Ottawa. The Greenfield is not cultivated to any extent at present. We have very little curculio in our district. The heat of summer develops the insects very rapidly, and the eggs of insect pests will live through the severest frost of winter. Peaches are not grown in our district, and we have no cherries.

Grape Culture.

To the Chairman.—Grapes are being cultivated a good deal, though this culture is yet in its infancy like that of other fruits. Any variety that will ripen before or at the time of the Concord will succeed with us, anything later will not do. The vine of the grape being pliable, we lay it down and cover it with earth during winter, thus making, as it were, an artificial isotherm for this fruit. A covering of from four to six inches of soil would not permit of a thermometer sinking below from 25° to 30° F. and prevents the sun's ray from making any rapid changes in a heat register; in fact, from experiments made during a season, it is found the range of the glass at the depth of one foot travelled over an interval of only 25° F. It will thus be seen that with our summer sun heat we could grow any tropical plant which can be protected by earth during winter and that will stand such a prolonged burial as almost seven months. Many experiments I have made with the peach shews that it will not allow of this treatment, and I am now engaged on experiments with the fig. The date at which the Concord ripens is from the 20th to 25th September. The men who have been most successful in grape culture have grown them on a dark shale soil, sloping to the south; but any dry soil will do, especially if it has a southern aspect. We have no surplus grapes and there is a ready demand for all grown. The fruit is usually sold at from 10c. to 12½c. or 15c. per pound, and retail at from 15c. to 20c. per pound. I should say grape culture is profitable with us. White grapes sell highest, red next, and the black last. We never have any June frost on high ground. The only disease that has affected the grape vines is mildew. There is an insect that perforates the leaf, but I do not know what it is; it does not do a great deal of harm. The robins are very destructive to the grapes, and the wax wing, or cherry bird, to the raspberries.

To Mr. Dymond.—People continue to plant grapes. The Fruit Growers' Association of Ontario, by their efforts, have stimulated the growth of fruits generally more than anything else. Some private persons have made wine, but none has been made for sale. Frosts come upon us with considerable regularity about the end of September. The earliest are not always severe, only striking the top foliage. Sometimes we have the grapes hanging on the vines till the middle of October.

Strawberries.

To the Chairman.—Strawberries are cultivated in our district, and their cultivation is increasing. The whole of the product is consumed in the district. People generally grow the Wilson strawberry because it produces a heavy crop. The New Dominion is an excellent berry, and is grown a good deal. I have some of Mr. Arnold's varieties. Some of them are exceedingly fine. His Number Twenty-three is going to be one of the best ever produced, I think. There are no strawberries grown by the acre. I think the Ottawa Valley will be the garden of Canada for strawberry culture, because the snow lies so well that there is no necessity for covering the plants, and the soil is well adapted for their growth. Twelve to fifteen cents is the average selling price. We have no birds which are destructive to this fruit. The May beetle sometimes attacks the plants, but not to any serious extent.

To Mr. Dymond.—There are no large staawberry grounds at present. One gentleman planted about two acres on a low piece of ground and they failed, as the water stood on the plants in spring. We had sufficient snow last year to protect our strawberries, though in other parts of the country they did not. The dry soil around Ottawa,

where the water does not lie, is very desirable for strawberry culture. We import large quantities of strawberries into Ottawa every year, but there is no necessity for doing so if people only knew it. By the investment of a little capital, the selection of a proper soil, and the exercise of ordinary care, the district might become a vast strawberry field. The wild strawberry grows one hundred miles below Quebec City as well as it does in Western Ontario.

RASPBERRIES.

To the Chairman.—Of raspberries, we grow the Red Antwerp, Brinckle's Orange, the Black Caps, and Mr. Saunders' Hybrid. The colour is rather against Mr. Saunders' berry, but it is very prolific.

To Mr. Dymond.—I do not think Mr. Saunders has given his hybrid any name yet. It is a most wonderful hybrid, because it is such an intimate cross between two varieties which are totally distinct from each other. The characteristics of both parents are easily recognized in it. I have planted some seeds from it, and I have raised both red and black raspberries. It is from the seeds of this raspberry I expect the future raspberries of Canada will be grown. The two parents being natives, they will stand any climate. The fruit of the seedlings from Mr Saunders' hybrid are some of them larger than either parent. His raspberry is not very large, about the size of the Philadelphia, but it bears a heavy crop.

To the Chairman.—We do not lay down Mr. Saunders' hybrid raspberry or its seedlings, but we do the others. The price realized per quart is from 12c. to 15c. The raspberry saw-fly perforates the leaf, but may be got rid of by using hellebore. We can do nothing with blackberries.

To Mr. Dymond.—Raspberry culture has not been carried on very freely. Mr. Saunders' raspberry was sent me from his first lot. I think there will be a large growth of it when it is better known, though it is very difficult to propagate. Mr. Arnold and myself hit upon a plan for its propagation, by laying down the canes, and as the branches grow we cover the old cane up and the new wood will take root. The wild raspberry is very common with us and is sold on large quantities on the market.

CURRANTS—GOOSEBERRIES.

To the Chairman.—Of currants, the red cherry and the white grape are the most esteemed. Their culture is profitable, or rather it has been until this year, but something is attacking nearly all the plants. There is plenty of demand for them at 10c. or 15c. per quart. The currant borer is very injurious. The bushes do well on a dry soil. The currant worm inflicts great damage unless it is looked after with hellebore. There are two worms that injure the currant bushes, the saw-fly and the measuring worm. The latter is the more destructive, because it is the harder to kill. The black currant is cultivated with us, but is not so profitable as the red, though there are not so many insects to attack it. The fruit produced is consumed at home, and the price realized is from 10c. to 15c. per quart. The bushes suffer occasionally from the measuring worm. Gooseberries have hitherto been the most profitable fruit crop we have. The Houghton is generally grown, and the price usually realized is from 10c. to 15c. per quart. We sell it green for stews, etc., and about half ripe for canning. It is too small for a dessert fruit. None of the native improved varieties are subject to mildew to any great extent. The currant worm is very destructive to the leaves. The fruit worm, which pierces and destroys the unripe fruit, is a serious difficulty. We have no remedies for it. The only way to arrest its ravages would be to catch it on the wing. The bushes should be planted not less than five feet apart, and will do well on any dry soil.

To Mr. Dymond.—The sorts of gooseberries we have are not seriously affected by the mildew. We have tried the English kinds, but the above disease is fatal to them. The kinds we cultivate are small. I was the first to bring gooseberries into notice in our section of country, a number of years ago, and have done what I could to extend their cultivation. The Houghton was the variety introduced. It has evidently been

produced by a chance or artificial cross between some English kind and the wild smooth gooseberry. The Downing I think is from the Houghton, again crossed with some English berry. The French people gather and sell the wild gooseberries. The prickly gooseberry is rather larger than the smooth, which is quite a small berry. There is nothing to prevent an unlimited growth of gooseberries in the neighbourhood, if the insect pests could be destroyed. The Whitesmith, the Ironmonger, and several other English varieties have been tried, but none of them will succeed on account of mildew. There are not enough gooseberries grown to supply the local demand.

Local Nurseries—Pedlars.

We had a nurseryman in the vicinity of the city but he has moved away. We have a nursery situated on the Canada Central Railway, called the Renfrew Fruit and Floral Company. Experiments in fruit culture are being made by amateurs like myself. Mr. O'Docherty, a barrister in Ottawa, is planting a large fruit farm. He is just beginning. His farm is situated in Carleton county. He is going into fruit culture very largely, but has not been very successful yet. His plants are principally cuttings. He is planting grapes, gooseberries, strawberries and some raspberries. He has taken no special means to protect his grounds by wind breaks or other shelter. The cranberry grows wild with us, it is not cultivated. Our fruit trees chiefly come from Rochester, such as apples and small fruits, also grape vines, etc. Tree pedlars come over and push business. No Canadian agents present themselves. Some cultivators get a few trees from Mr. Arnold, Mr. Leslie and Mr. Beadle, but not in large quantities. Canadian fruit tree cultivators do not press their business with the energy of the Americans. There is a duty to pay, so that there is no advantage to the Americans. They generally bring over a carload of trees in the spring and sell them by auction, and people get them very cheap. There was an American selling the Champion grape in Ottawa this spring under the name of the Beaconsfield. I immediately published a letter in the press saying that these grapes which he sold for fifty cents could be purchased for fifteen. Nothing was done to punish him, but the publication of my letter in the local papers put people on their guard against him. The late Malcolm Cameron showed me a very fine Balm of Gilead poplar, which he had purchased from one of these pedlars for an apple tree. These men, however, do a great deal of good by awakening people to the advantage of planting fruit trees. The trees grown in Rochester are most decidedly unsuitable for our region. Trees require acclimatizing, and, besides, people buying from agents do not know what they are getting, as they put any name on any kind of tree, and it is some years before the fraud is discovered and cannot then be rectified, as the agent has flown, and his employer disowns "his ways that are dark and his tricks that are vain." I think trees suitable for our district should be grown there and properly cultivated.

Melons.

To the Chairman.—We cultivate musk melons. The Montreal Nutmeg and the Cantelope are esteemed. The Japan melon is also thought highly of. We get the fruit to ripen earlier than here; we have ripe melons about the end of July or the beginning of August. They are grown in hot beds, in pots, or on reversed sods, and when the plants get from four to six leaves on them they are put out into beds, of, say, four plants in each, with a wheelbarrow load of hot manure under them. Sashes are then put over them, and in this way the plant receives no check from the time the seed is sown until the autumn frosts. The striped beetle is injurious to the plants. A dark, shady soil is preferred to light sand for melons, as it attracts the sun's rays.

Trees and Tree Planting.

To Mr. Dymond.—I have planted a good many trees about my place. I think about one-third of the cultivated part of my district is under original bush, and the uncultivated

part is all bush and pasture. Hard timber grows on the heavy land and pine on light sandy soils. We have no great quantity of hard timber growing in our district. The principal hard timber used for fuel is hard and soft maple and birch. The timber lands in our region are nearly all pine. Where the pine has been removed a second growth springs up, but I doubt if it will be worth much for commercial purposes. Where the forests have been destroyed by fire the second growth is composed of pines and poplars, principally the latter. In regard to forest trees, I believe it takes a forest to make a forest, for unless the trees are drawn up to the light through the boughs of other trees, the stems are short and branchy, and consequently are of no use for saw logs. Second growth pines are of little value.

Economical Woods.

The quantity of hardwood is very limited, and is principally birch. Hardwoods are considerably in demand for local use. People are beginning to ornament their houses by laying floors and making doors of different coloured woods, alternating dark and light-coloured. Butternut is greatly used for lumber with us. If stained dark it resembles black walnut; we have a large supply of butternut. There is no black walnut growing wild with us. I have been cultivating the black walnut, but not with very great success. Mr. Eddy has a large manufactory of wood-work at Hull, near Ottawa. His manufactures are principally of pine. He is making utensils of wood pulp or *papier-mache*. He imports the pulp.

To the Chairman.—The frames of ploughs and harrows are principally made of oak or elm. Tool handles are made from hickory, ironwood, white ash; black ash is made into rake and broom handles, and things of that kind. Hoops, firkins and tinnets for butter are also made of black ash. Basswood is used for the bodies of vehicles, and hickory for the spokes.

To Mr. Dymond.—The wood used in the manufacture of these articles is obtained in the district. Butternut is called gray walnut when cut into boards, and is much used for furniture.

To the Chairman.—For furniture, maple, butternut and white ash are used. I think butternut is the leading timber for these purposes. Birch and maple sell for fifteen dollars a thousand, ash, twelve dollars, and basswood, ten dollars. We have some cherry, and it is considerably used. We have no paper manufactures in our district. The poplar is made into charcoal for smelting purposes, as we have iron mines in the district. Hardwood is also used for that purpose, but good poplar is considered best. We have very little oak. Tamarack is used for railway ties. We have an unlimited supply of it, and I believe it will be one of the best trees to plant for that purpose. The European larch has not been extensively introduced. For ties, from thirteen to twenty-five cents are paid in the woods. No attention is being paid to the systematic preservation or thinning of old or new forests. I think the reduction of taxes on lands used for the planting of forest trees, a system which is carried on in the United States, would be a good plan for encouraging such work. A proper inspector, of course, would be required.

Experiments in Forestry.

To Mr. Dymond.—I have made some experiments in forestry and tree-planting. There has been a good deal of talk before the Commission about growing trees from the seed, but if I were going to plant trees, and particularly maples, I would go into the woods and pull up seedlings a few inches high, as I am convinced they will succeed better than by any planting of seeds. I planted a number in that way, and they are the best lot of young trees I know of. I planted them in nursery rows, about six inches apart in the row, and I have succeeded in raising a large number without losing any. I trimmed the roots before planting. There are both hard and soft maple found in the ordinary maple bush, and I think birch could be propagated in the same way. I have

grown the sweet chestnut from the seed. It grows wild, I believe, near St. Thomas, Ontario. The wood is greatly used for making nice furniture in the United States. I lost all the first lot planted, but am trying them again. I am not quite certain whether they are hardy. The horse-chestnut and butternut succeed well from the nuts. Hickory grows in our neighbourhood, but is not very common. I have never tried transplanting the hickory. I believe Mr. Gott, of Arkona, has gone extensively into the business of collecting forest tree seeds, and sending them to the United States. For shade trees, I think the elm and the maple are good. In our region you can collect the seedlings of the elm in the same way as the maple. I collected the young seedlings in the autumn; they were the seedlings of that year. There has been no replanting of the oak in our district. It is not an oak district. The tulip tree would not grow with us. I have the common balsam, but I do not care about it at all, and I do not think much of the native Canadian spruce for planting out as an ornamental tree. I much prefer the Norway spruce. The native trees appear to get impoverished in appearance in ten or twelve years. The cedar is principally used for hedgerows with us. The hedges are grown five or six feet high. I have seen no spruce hedges. The cedar makes a very stiff hedge; nothing can get through it. I think the wild plum is one of our best hedge plants. It is very thorny and grows rapidly. Some object to it on account of the curculio, but in our part of the country we have no trouble with the little Turk. The wild plum is very hardy and stands cutting well. The barberry grows very well and is perfectly hardy; it makes a good hedge plant. The buckthorn grows well and is hardy.

Sparrows.

The English sparrow is very common with us, but we lost a great many by a falcon hawk which stayed all one winter in Ottawa and lived on them. In my opinion, the sparrow is insectivorous. We used to require a machine to gather the grasshoppers from the ground in front of the Parliament buildings, but when we got the sparrows they soon made the grasshoppers scarce. I have never found a sparrow eating the buds of trees, and I can say nothing against the bird. I have not found them destroying anything, but there are not a great many yet around my place, they keep about the centre of the town. I do not believe the stories about their destroying other birds. I have seen them eating grasshoppers over and over again, as well as the common earth worms. The cherry bird is destructive to raspberries and other fruits.

Shade Trees—Shrubs.

I think, for planting trees along fences of farm grounds, I would select the hickory and the black walnut, as they are both valuable trees. The hickory is used in short pieces for spokes, handles, etc. A good many trees, like the maple, would not be worth much for timber grown singly along fences, but would do well for shelter from the sun for cattle. For home decoration I would recommend the cut-leaved birch, the cut-leaved maple—both being exceedingly beautiful trees—the Norway spruce, the Austrian pine, the hard and soft maple, the elm, the butternut, the black walnut, and the sweet chestnut. Of the flowering shrubs that are hardy, there are the syringa, the guelder rose, spireas, Tartarian honeysuckle, lilacs, etc. I should say that a farm well planted with trees would be worth from two dollars to five dollars per acre more than one not so planted. I think tree planting might be encouraged by offering prizes at the agricultural shows. They might offer a premium for the best planted farm within a certain district. I think in Ottawa the corporation offer twenty cents a tree for each one planted on the side of the street, growing a certain number of years. A popular hand-book on forestry for circulation amongst farmers and others would be useful. I am familiar with the reports of the United States on the subject, but they are too voluminous for general circulation. I do not think much could be done in forest tree planting along country roadsides, unless there was a law passed preventing cattle roaming at large, as

they do now. I drew up a report to the Fruit Growers' Association on this subject, which has caused a great deal of discussion in Ontario. I advocated that in the best settled districts of Ontario cattle should not be allowed to run, because it is useless to think of planting trees along the road if the cattle are not kept in. The present plan originated when the country was new. It was right then to fence the cattle out, as the area of cultivated land was small, but people should now be compelled to fence the cattle in, as the pasture land is less than that devoted to crops, and thus a large item would be saved in the matter of fences, which is every year getting to be a heavy item of expense, and will be more so as wood becomes scarcer and dearer. My theory is that if a man has no cattle of his own, he should not be compelled to build a fence to protect himself from his neighbours' cattle. In many parts of the continent there are places where no fences are to be found. In Italy the absence of fences is a conspicuous feature of the country, and there is no protection to the fruit except that upon very choice vines there is sprinkled a little whitewash, and those vines are respected by the people who pass along the public roads.

P. E. BUCKE.

Sittings to take oral evidence held at London, Ontario, July 20th and 21st, 1880. *Present*—Mr. Wm. Saunders (Chairman), and Messrs. A. H. Dymond and Richard Gibson.

MR. ALLAN'S EVIDENCE.

Alexander McD. Allan, of Goderich, was called and examined.

Fruit in the Huron District.

To the Chairman.—In our district we cultivate apples, pears, plums, peaches, cherries, grapes, nectarines, apricots, quinces, currants, raspberries, strawberries and gooseberries. By our district I mean the County of Huron, though a good deal of what I have to say will apply to parts of Perth and Bruce. There are about 6,540 acres under orchard and garden in the County. In apples, 4,870; plums, 330; pears, nearly 90; peaches, about 52. We have about 50 acres of strawberries, nearly a hundred of grapes, and about 80 acres of other small fruits. Fully two-thirds of the cherry trees are in bearing, and about one-half of the apple trees. Apple trees begin to bear plentifully with us in from eight to twelve years, according to the variety. The estimated quantity of apples produced in our county in 1879, is 435,000 barrels. Those that have been grown in past years have been largely fall sorts, but when those now being planted shall have fruited, we will have chiefly winter varieties. Those coming into bearing now are pretty well divided between winter and fall varieties.

The Soil.

Our general soil is of a light character—sandy loam, with small gravelly patches. Of subsoil, a considerable portion is clay, but we find that apples succeed well all over the county. We have not found very much choice in aspect. It is largely a matter of taste with most people.

Fruit Tree Planting.

I would recommend apple-trees to be planted 30 feet apart at least; some would say 40, and I would not object. Pears and cherry trees we plant 20 and 25 feet apart; plums and peaches 15 to 20. The summer apples most profitable are: Red Astrachan, which

we use for both cooking and market; Keswick Codlin for cooking; the Early Joe and the Indian Rare Ripe for dessert. The Tetofsky is being cultivated and is much thought of by some growers. Upon some soils it is just about as early as the Astrachan.

Price of Apples.

For early apples, the average price per barrel is from 60 to 80 cents. There is a surplus of early apples which is mostly fed to stock. Of fall apples, the most profitable are the St. Lawrence, the Alexander, the Twenty-Ounce, or Cayuga Redstreak, the Fameuse—which we consider a fall and first of winter apple—the Porter, the Autumn Strawberry, the Fall Pippin, and the Duchess of Oldenburg. The price of these would be about 70 to 80 cents on the average. The varieties I have mentioned are all hardy with us.

Disposal of Surplus Fruit.

The surplus of fall apples is disposed of by feeding to stock, and some are converted into cider. There is not much cider manufactured for sale, and not much is done in the way of drying, except in the old-fashioned way of stringing up fruit and drying it for family use. We have done very little in the way of shipping fall fruits. I have been looking to Manitoba mostly as our future market, if we can get rapid transit there We think we could then dispose of our surplus fall stock.

Winter Apples.

The winter apples most esteemed are the Northern Spy, the Baldwin, the Rhode Island Greening, the Æsopus Spitzenburg, the King of Tompkins County, the Ribstone Pippin, the Swayzie Pomme Grise, the American Golden Russet, the Wagener, and the Green Newtown Pippin. The Ribstone Pippin succeeds well with us, and we consider it a profitable variety; it is well liked for family use. The Northern Spy is rated No. 1 with us. Some put the Rhode Island Greening second, and others the Baldwin. For the home market the Northern Spy, the Rhode Island Greening and Baldwin, are the most asked for. None of our local storekeepers think of keeping any others than these and the Fameuse. For shipping, the Northern Spy comes first again. They are a little tender skinned, but when properly packed they carry well. Then come the Rhode Island Greening, the Baldwin, the Green Newtown Pippin, the Æsopus Spitzenburg, the Ribstone Pippin, and the King of Tompkins County. Of our winter apples the shipments for last year were 180,000 barrels, and the average price was from $1 to $1.75, the latter price only for very choice fruit. Choice Northern Spy and Rhode Island Greening apples always command the highest price. For the European market, colour is wanted, although Rhode Island Greening and Green Newtown Pippin are readily purchased at high prices. One Glasgow firm, to whom one of our apple growers shipped an assortment of apples last year, wrote back asking for all the Rhode Island Greenings he could procure, in preference to other sorts.

Seedling Apples.

I don't know of any seedlings which I would recommend for general cultivation, simply because those we have are late fall apples.

Fall Varieties.

The Maitland is a very fine apple, about the size and shape of the King of Tomkins County, and is a prolific and regular bearer. The flavour is good, crisp, vinous, and pleasing. An English apple named the Taylor Fish is very highly esteemed; indeed I consider it the best fall cooking apple we have, and when perfectly ripe it is quite pleasant to eat. The tree is a rapid grower, bears early, and regularly heavy crops. The apple is much of the size and form of the Kentish Fillbasket.

[*Mr. Allan.*]

Apple Blight—Insect Pests.

We have had some attacks of the blight, but they have been very slight. The Transcendant Crab, and the Keswick Codlin are the varieties most subject to it with us, the trees, in some instances, being almost killed out in one season. Twig blight is very common this season on many varieties, but does not extend beyond the extreme ends of the new wood, taking about six inches of that. The borers have not been very destructive, though there have been some traces of occasional attacks by them. The tent caterpillar has not troubled us since 1877-8, but the codlin worm is becoming more and more prevalent in the fruit year by year. I find that a good many of our largest fruit-growers are in the habit of building small fires under the trees at night when the blossom is on, and the moths are attracted to the flames and burned. They find that by this means they can destroy them by hundreds. They also tie strips of cloth around the trees in order to collect the *larvæ*. The remedy for the caterpillar is to look after the tents and destroy them.

Cultivation of Orchards.

I believe as truly in cultivating for fruit as I do for corn, wheat, or other grain, and it is profitable to do so until the orchard becomes old, when it is difficult. Even then, the soil can be worked around the trees and manure applied in liberal doses. The only reason I would have for seeding down, even temporarily, would be, that the trees were running to wood too much.

The Apple Market.

To Mr. Dymond.—We get from 60 to 80 cents per barrel for summer and fall apples, but we don't regard that as a profitable price. That is the average price for the entire crop of summer and fall apples, and we don't dispose of all of our surplus even at those prices, so that at present the cultivation of that class of apples is unprofitable. There is no prospect of obtaining a home consumption for them. We have not gone into a close calculation as to how profitable it would be to export them to Manitoba if we were able to get rapid communication with that country, but our idea is that we could dispose of all our surplus stock at profitable rates. The unprofitableness of summer and fall apples is the reason why we are turning our attention to winter varieties. In the late fall, before the frost sets in very strongly, buyers come around and purchase the fruit, and local men also pick up a good deal. The orders come in for so many barrels of each particular kind. I think ours are mostly purchased by Toronto men for shipment to the Lower Provinces and to Europe. We have not particularly turned our attention to the class of apple likely to be popular in England, though we are beginning to do so now. I don't think there is any peculiarity in our district favourable to the Ribstone Pippin. The tree requires very careful cultivation or the fruit will run out. It is a very popular apple in England, and it goes along with others to that country. We don't do much packing directly for the English market; we merely put them into barrels. I think it would be desirable that we should put them up for direct shipment so that they would not be further disturbed. I believe they are often culled and graded after we pack them.

Mode of Packing.

I would recommend the Tomlinson barrel to pack apples in for shipment to Europe. It is made in the form of a cylinder, without any bulge in the centre; it is cut in one piece from elm log, similar to the common cheese boxes. The piece (or shaving) can be put together double and joined at the sides by splice and nailed well. These barrels are often used for oils and vinegar. At the top and bottom good-sized hoops could be placed upon which the barrels could be rolled in shipping, thus saving the body of the barrel from any pressure. These barrels, I am told, can be manufactured in quantities fully as

cheaply as the common sort. Very choice apples should be individually wrapped in tissue paper. Wheat or oat chaff, well dried, would make a good packing, as the fruit could not gather any flavour from thoroughly dried chaff. I would sprinkle the bottom of the barrel with chaff, lay down apples (eyes downward), and sprinkle enough chaff over to cover and pack tightly between all apples, put in another layer of apples and continue on thus until the barrel is filled, when the head can be pressed down with a screw or lever. If necessary air holes can be made in the barrels.

The question as to what would be the best apples for England has been discussed by us, but opinions vary. In England they incline strongly to highly coloured fruit, and it must be a fine dessert apple, of medium size, and good flavour.

English Favourites.

We have been asked for the Green Newtown Pippin, and we are cultivating it now. In 1879 we shipped Baldwin, Northern Spy, Rhode Island Greening, Green Newtown Pippin, and Æsopus Spitzenburg, a choice lot to Liverpool, and the same buyer asks for another and a much larger supply, at advanced figures, this year. The shipment in 1879 was in good barrels, lined with paper, and all carried well. Ours is a very favourable fruit-growing district.

Pear Culture.

To the Chairman.—Pears grow well on our general soil. We have a clay sub-soil in some sections. The varieties of summer pears which we esteem are the Bartlett, Clapp's Favourite, Tyson, and Osband's Summer. Autumn pears: Flemish Beauty, Louise Bonne de Jersey, Sheldon, Seckel, Belle Lucrative, Duchess d'Angouleme, and White Doyenne. Winter pears: Beurre d'Anjou, Beurre Clairgeau, Lawrence, Beurre Diel, Vicar of Winkfield. The most popular pear is the Bartlett; on account of its being so profitable, it is far ahead of the others. The standard trees are preferred to those grown on quince roots. We don't ship many pears. The crop is mostly consumed in the neighbourhood, though some growers ship the Seckel every year. The average price is from $1.50 to $2 per bushel.

Gathering the Fruit.

We generally gather the fruit as soon as it has attained its full maturity and bloom. The Bartlett is picked probably earlier than any other variety. We don't allow the fruit to ripen fully on the tree, but gather it while it is still forming, and allow it to ripen indoors.

Pear Blight.

We had some pear blight some years ago, and in some sections it is very bad now. The use of the knife is supposed to be the only reliable remedy, though it is claimed by some that blight can be prevented by using linseed oil as a wash, and well mulching the trees in summer and winter—light in summer, and heavy in winter to prevent the frost affecting the roots. Several orchards in which this is practised have never been troubled with the blight.

The Borers.

The borers are not very bad with us; and although the slug attacks the trees, it is very easily got rid of by dusting the trees with common dust, plaster, lime, or dry ashes.

Causes of Blight.

To Mr. Dymond.—The cause of blight is supposed to be atmospheric, but that is by no means certain. It is a good deal worse some years than others, and I have noticed that after winters when there was little or no snow to protect the roots, we generally

have blight, especially if the sun is very hot. Some aver that trees generally take it in soils where they have a good growth and throw out a large quantity of wood, and they claim that the wood should be cut back in early fall. I believe in the use of linseed oil as a wash, for I have tried it myself, and have had others try it with marked success. The leading symptom of blight is the wrinkling or contracting or tightening of the bark, so as to stop free circulation of sap; the linseed oil will, in a few hours, loosen the bark, and I believe in this way check the disease when it has not got too much headway.

Plums—The Curculio.

To the Chairman.—Our county has been celebrated for its plums, but we cannot say that plum culture is profitable now, as growers have been pretty well discouraged by the curculio and the rot. They cannot undertake to save the fruit by the usual method—jarring the trees—because the expense is too great. We did not have much of the curculio in 1874 and 1875, though there were slight traces of it. The first few years of its appearance it was regarded more as a benefit than an injury, because, formerly, the crops were so heavy that they used to break down the trees. The curculio used to relieve this trouble, but now he takes the whole crop. Plums succeed well on all our soils.

Preferred Varieties.

For home consumption and for canning purposes, all the light-coloured plums are preferred, such as the Lombard, Coe's Golden Drop, and the Gages, and the Pond's Seedling is also well liked; but our best plum is a local seedling. The Fellenberg is also highly esteemed.

A Local Seedling.

We have not given our local seedling a name, and I have not been able to trace it, although I have tried the different growers here and in the United States. It is a purple plum, something like the General Hand in form. It has a strong, medium-sized stem, and is about the same size as that plum. In colour, it is fully as dark as the Prince Englebert. Messrs. Geo. Leslie & Son, of the Toronto Nurseries, are now propagating largely from it. Mr. Bingham, the gentleman who had it first, calls it Bingham's Special Favourite, though he has the recognized Bingham plum. All that he knows about it is, that he found it on a common where a farm had formerly been. The occupant having left, the land was allowed to go wild. He found this tree and transplanted it.

Profitable Sorts.

The most profitable plums to grow for market are the Common Blue and the Lombard, on account of their good shipping qualities. All the standard varieties find a ready market, however, although considerable loss is experienced in shipping many varieties to a distance. The Common Blue plum we look upon as a native. It was very largely grown ten or twelve years ago. At that time we must have grown three or four times what we do now.

Market for Plums.

Our plums are shipped to Toronto, Buffalo, Port Huron, Detroit, and occasionally to Toledo and Saginaw. Last year we shipped 2,273 bushels, mostly to the United States. We don't rely upon the Toronto market very much as it is apt to get glutted on short notice. At home, the average price for the Common Blue plum is $1 to $1.50 per bushel. The larger varieties sell at from $1.50 to $2.25. The Common Blue plum brings from $1.75 to $2.25 for shipping purposes, and the others range widely from $2 to $4, and some even higher in the States. The Common Blue plum carries best, and the Lombard next. The German Prune carries well, and the demand for it is improving. Good specimens brought

[*Mr. Allan.*]

$3.20 per bushel in Saginaw last year. The Fellenberg is also asked for in Saginaw. Most of the varieties are packed when they are somewhat hard. We pack them in boxes made of lath, with a division in the middle of each box. They average twenty-three pounds to the box.

Insects and Diseases—Black Knot.

There is no insect that we look upon as an enemy to the plum except the curculio. We have the black knot, but we don't regard it as a formidable enemy, though we insist upon the people cutting it. I think it is an advantage to cut it early, before the knot bursts, and cover the wound with salt. Recent legislation has not helped us much, with regard to the black knot, because we cannot get persons to take hold of it, though the Horticultural Societies sometimes do. We have never had to prosecute. A warning, generally, is sufficient. We just go to the person in whose orchard it is found, and tell him kindly the harm he is doing to himself and others by allowing it to remain. We find the black knot on all varieties of plums, though I think the Common Blue is about as liable to it as any.

Seedling Plums.

We have had several seedling plums, but none which I could recommend for general cultivation, excepting the one already mentioned. We have no trouble with birds attacking the plums.

Salt as a Fertilizer.

We are now beginning to use salt largely as a fertilizer for the plum, and we look upon it as one of the most profitable fertilizers that we can get. The usual price is about $2 per ton; but farmers are willing to pay $2.50 or $3 per ton rather than be without it.

Soil for Plums.

To Mr. Dymond.—Ours is rather a light soil, but some growers say that the plum thrives best on a heavy soil. With us it seems to make little difference. We never found that a stiff clay soil had any effect on the curculio, except that upon such a soil you can find them around the tree.

Effects of the Curculio.

The curculio came in gradually, or, rather, when it did come it was allowed to have its way. At present it looks as if people were going to give up plum culture altogether on account of its ravages. It begins its work the moment the plum sets. Sometimes you will find that plums not much larger than a pin-head drop off the tree from its effects. We have not many wild plums except the Blue, which we look upon as a native. The peach does not suffer much from the curculio, even when the trees are near plum trees affected by it. We don't find that a very severe winter has any effect on the curculio. Some thought last winter would be fatal to the curculio on account of there being very little snow; but such was not the case. Some growers are still making efforts to keep it under, and those who continue to do so find that they can realize very fair crops. The Common Blue plum which we have is much the same, I think, as the one they have in Prince Edward County. In the neighbourhood of Walkerton, in the County of Bruce, there is not a sign of the curculio, but it has appeared in the neighbourhood of Owen Sound, which is a fine plum-growing region. There is a large district through that northern portion of country where plums can be successfully grown. I have tried lime as a remedy for the curculio, but it has no effect. I believe salt will kill it if used in large enough quantities, and plum trees can stand a very large quantity. You can put on enough salt to kill every spear of grass around the tree without injuring the tree itself. Smith's Orleans proves one of our best plums both against the curculio and rot. Lombard is also good in this respect, and the German Prune.

[*Mr. Allan.*]

The Rot.

For the past three or four years the rot in the plums has been very destructive, in many cases I have known growers take much trouble to save a crop from the curculio by jarring the trees and the rot would then set in and destroy the entire crop. The disease is very infectious, the slightest touch of a healthy plum to a diseased one will convey the disease. Some claim it to be an atmospheric fungus, while others contend that it results from the sting of the curculio. I incline to the first opinion, although I can see how it is possible that rot could result from the sting of the curculio when the fruit has attained full growth and the ripening process fairly commenced, for at this stage any wound in the plum will incline to rot in a few days, and the sting of any insect contains poison enough to induce rot.

Peach Cultivation.

To the Chairman.—Peaches are grown with us to some extent, and they can be very profitably cultivated, as the trees stand the winter well. For forty years back we have had no instances of winter killing for at least six miles inland along the lake section. With most growers the Alexander ripens earliest; with some, Hale's Early. Beatrice comes in early and is a good peach, but rather small for a valuable market fruit.

Varieties of Peaches.

Amsden's June is in favour with some, but is not generally considered so early as at first represented. Crawford's Early is looked upon as being, on the whole, the most profitable. All our finest peaches bring high prices in the market. One grower recommends Hale's Early as one of the best. Some are inclined to a local seedling for heavy bearing. In the crop of 1880 Alexander came in first, and was profitable as a crop. One of our best growers says that he would plant Alexander, Hale's Early and Early Crawford for profit before any other three that could be named.

The Market for Peaches.

The home demand is sufficient to consume the whole crop, but some are shipped simply because the finest varieties bring more elsewhere than at home. Last year we got $3.20 per bushel for the Louise. Sometimes the price is $2.80, and it goes down even to $1.50

The Yellows—Insect Pests.

We have had no sign of the yellows in our peach trees. The peaches have not been materially injured by the curculio, and though we have had the borer its ravages have not been serious. We have also the leaf-roller, but it is not looked upon as being very troublesome.

The Best Soil for Peaches.

Peach trees succeed best with us in light, sandy, gravelly, or loam soils.

Seedling Peaches.

We have a large number of seedlings. Years ago, every farmer had a number of seedlings, but many neglected to renew with better varieties or even seedlings. At present we are testing a number of seedlings, some of which give promise of excellent results. Mr. George Cox, of Goderich township, has grown a large number of seedlings from year to year, and among them he has four very superior ones, indeed they are equal to any of our known varieties in size and flavour, and exceed them in productiveness. They are all high coloured, juicy and rich; one has flesh strongly resembling Early Crawford, and

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flavour fully as strong; three are free stoned and one cling. They bring equal prices in our market with any of our best kinds; they ripen from about August 27th to September 8th or 10th. The trees are large and strong, very hardy and heavy, and regular bearers. I consider these four varieties well worthy of general cultivation, and being naturally hardy they might succeed in locations where others fail.

It has been well illustrated in our local markets how much better it is to cultivate good varieties than the common run of seedlings, the prices of common seedlings range about $1.25 to $1.50, while good varieties bring readily $3 to $4. To the grower, the expense of the poor variety is as great as that of the best, while profit differs widely, as shown by the above figures.

Apricots and Nectarines.

We grow apricots and nectarines to some extent, but they are grown only by amateurs for home use. There is no particular reason why they should not be grown more extensively, for they succeed well. The curculio troubles them, but not very much. The nectarine ripens very well with us. Any varieties grown in Canada succeed well in our district. The Early Golden, Breda, the More Park, the Barton, Elruge, and the Stanwick are mostly grown. The nectarine stands about the same as the peach in regard to enemies. They are mostly grown along the lake shore, in the neighbourhood of Goderich. The apricot is affected pretty badly by the borer, but there are no other pests which attack it.

To Mr. Dymond.—Our market for peaches is Toronto and intermediate points, and we have not sent any to the United States, though I suppose we could send them to Chicago. The apricot is cultivated to a very limited extent at present, so that the curculio can be kept under with ordinary care. Large plum growers don't pretend this year to fight the curculio at all. There are not many who depend upon the growth of plums for their income.

To Mr. Gibson.—I don't think apricots or nectarines will compare with the peach, as a crop, as they do not bear so well, though they do bear fairly regular crops. I believe it would be an advantage to increase the cultivation of these crops, though I have not tried to find a good market for them east. Locally we do not find them in the market at all, though I fancy they might be sought after, but they are fruits that are at present really unknown. They ripen in July, August, and September, according to variety. They are considered very nice canned or pickled.

The Commission then adjourned until Wednesday, at 9 o'clock a.m.

London, *Wednesday, July 21, 1880.*

The Commission met at 9 o'clock a.m.

The examination of Mr. Alex. McD. Allan, of Goderich, was continued.

Cherry Growing.

To the Chairman.—Cherries can be profitably grown in our section. We grow mostly the Heart varieties, the Elton being the favourite. Of the Bigarreaus, the Elkhorn, the Yellow Spanish, and Napoleon, are the favourites. The May Duke is largely grown for market, and finds a ready sale for preserving. The Early Richmond is also liked. I see that the bulk of the crop brought to market, and sold for preserving purposes, are of the May Duke and Early Richmond varieties. The common Kentish cherry is grown to some extent, but not very much. We don't grow the Early Purple to any extent. Our crop is chiefly consumed at home, the price ranging, according to the variety, from six to ten cents per quart. For market purposes I prefer the May Duke and the Early Richmond cherries, because they are most sought after for preserving. The May Duke carries well when carefully packed. The Bigarreaus all carry well, because they are firm fleshed. We

have a seedling in our district which is the best cherry for export, called the *Ne Plus Ultra*. It is a large bearer, and has the peculiarity of bearing from the trunk right out to the tops of the limbs. It does not, as a rule, require the wood to be two years old to bear, but will sometimes fruit pretty largely on one year old wood. It is a bright crimson and yellow when ripe. I think it belongs to the Bigarreau class. It should be packed at maturity, and could be shipped to England, or even farther away, by putting it in small boxes. It is not subject to rot.

Enemies of the Cherry.

We do not find the curculio doing the cherry any appreciable harm, and no other insects injure it much. We have a leaf-slug, but it does not cause much trouble. This year we have noticed a long, dark coloured bug attacking the ripe fruit, and, apparently, taking the sweet juice of the cherry. I know the insect to see it, but cannot name it. It is a little larger than a lady bug, and of the same shape. I find that some growers are complaining this year of the presence of thousands of common, bluish coloured flies, like the meat fly, attacking the cherry trees. I account for their presence by the fact that when birds take the fruit they generally leave a piece of each berry, and the flies go to the broken fruit. The cherry is subject to rot, especially the Heart varieties. The robin is the bird most destructive to the fruit, and the cherry bird is also troublesome. There is no doubt that the robins destroy a large number of insects. I find them on the lawns picking grubs and worms, and if they would only take a limited amount of fruit we would not grudge it to them. As it is, the general impression is in favour of leaving the robin unprotected by law.

Cherry Tree Culture.

Cherry trees succeed best on light soils, inclined to gravel, and I think our soil is just suited to its growth. The trees make rapid growth, and they are not liable to break to any extent; but we are in the habit, when we find them growing too rapidly, of cutting them in a little. Cherries do very well either on sod or cultivated, but I prefer cultivation, especially if the soil is very light. Kentish cherries would range at about six to seven cents per quart, in proportion to the Hearts at ten cents.

Prospects of Demand.

To Mr. Dymond.—I think our district is very favourable to the growth of cherries. I cannot say that there is an increase in cultivation for market to any great extent. We could export considerably, and we have exported some, mostly to the east and the County of Perth. We have not shipped any, and we have not looked into the question of the profitableness of shipping them to England. I don't think such a trade could be made profitable at all. We have not done anything in the way of canning or preserving the fruit, except for domestic purposes. Extra feed, such as the use of liquid manures is apt to cause the wood to burst, and the fruit to crack. We are not in the habit of using liquid manures on cherries.

Habits of the Robin.

To a limited extent, I think, the robin feeds on insects, but that he chiefly devours grubs and worms on lawns, and that mostly in the early part of the year. The grubs and worms which he picks up on lawns would not be injurious as a rule. I have seen him feed on the currant worm, but it was to a very limited extent. We don't find him taking fruit till it is pretty well ripened. Between robins and cherry birds and the rot, many of our cherry growers are becoming discouraged, indeed, it is a rare thing to find a good crop of any of the finer varieties reach maturity. This season some of the Heart varieties were completely destroyed with rot long before they came to maturity. I have observed the rot set in as soon as the fruit had fairly set from blossom. I believe it to be an atmospheric fungus.

[*Mr. Allan.*]

Quinces.

To the Chairman.—We grow quinces to a small extent. They can be grown to perfection, but they have been neglected and planted in refuse corners, etc. A few growers do them justice, and they succeed admirably. The Orange is mostly grown, and the Angiers succeeds well, but it is not much esteemed. The trees bear regular crops. Some complain of the length of time required to bring the Angiers in bearing, but the fault is undoubtedly in bad usuage. There is not much demand for the fruit in our district. Our people do not seem to know anything about the quince, and the fruit is chiefly grown for home consumption.

To Mr. Dymond.—The increased cultivation of the quince would be concurrent with a large trade in preserving.

Grape Culture.

To the Chairman.—We grow a considerable quantity of grapes in our district, though they are grown mostly by amateurs. All the common, hardy varieties succeed pretty well with us, except, of course, the Catawba. The Concord and Delaware are preferred, as being the most profitable for market purposes. Grapes require a dry, rich loam, but succeed well in some of our gravelly soils. Thorough drainage is absolutely necessary for their success.

Local Demand.

We find a local demand for nearly all the grapes grown, but a few are shipped to Toronto, London, and other points. The average price ranges from six to ten cents per pound, wholesale. Grape culture is decidedly profitable in our district, and might be gone into on a large scale with advantage.

No Spring or Early Autumn Frosts.

We never have any trouble with either spring or autumn frosts along the lake shore, though inland they do to some extent. Our severe fall frost does not occur until November, as a rule, though occasionally we have them late in October.

Effects of Frost on Grapes.

With some varieties a slight frost is necessary, in order to make them worth anything: such as Arnold's Brant, which is useless until it gets a frost. All the varieties which are descended from the frost grape, are improved by frost, but such grapes as the Delaware are impaired by it.

Mildew.

We have no disease that affects the roots or leaves, except the mildew. I find that this year the Brant suffers worse from mildew than any others. I find it also on Rogers' Hybrids. I have only noticed it at all where there has been a lack of drainage and cultivation.

Vineyards.

To Mr. Dymond.—We have no vineyards of a large size. About three acres is the largest we have. I have heard from time to time of people, who said they were going into grape culture largely, but so far we have had no instances of the kind. They meant to with a view both of selling the grapes, and manufacturing them into wine. With us no wine is made for wholesale purposes. The area for the successful cultivation of the grape would extend inland for about four miles from the lake without danger of frost. I would limit our grape growing area to such a belt as that. We have frosts that cut off tender

vegetables occasionally, but don't hurt grapes. Dusting with sulphur will prevent mildew. I have observed traces of rot in some of Rogers' grapes last year, but it was not general. As a rule, I prefer a south-eastern exposure for grapes.

Insects and Birds.

To the Chairman.—We have no insect that does serious damage to the vines. The thrip is the only one we have at all, and it does not amount to much as yet. The robins are destructive, but they are not so severe upon grapes as upon cherries. They are the only birds I have noticed at the grapes.

Strawberries.

We grow strawberries considerably, and we cultivate the Wilson almost exclusively for market purposes. For home consumption we prefer the Triomphe de Gand, Monarch of the West, Sharpless, Green Prolific, Colonel Cheney, and the Charles Downing, with a preference for the first-named. Arnold's No. 3 is also well thought of. We have not had much experience with the Sharpless, but I don't think it bears out the claims that have been made for it as to its enormous productiveness. I don't think any of these varieties would be likely to take the place of the Wilson, as a market fruit. The Wilson is the only strawberry that is shipped, though some of our growers have been asking for the Triomphe de Gand. Steadily through the season, the finer varieties command a higher price than the Wilson. Large growers this season sold their fruit at wholesale at first at ten cents per quart, and lower as the season advanced, to eight and seven cents, and a very few sales were made at six cents. Sometimes, for extra early fruit, we get twenty-five cents, but generally they remain a long time at ten cents, and then go down. In favourable seasons, the usual product of the Wilson per acre, taking one year with another, would be about five thousand quarts. Amateurs, who give particular attention to the soil and cultivation, get far higher crops than that. The robin is destructive to the fruit, and he always picks the finest quality. We have no insects that seriously damage the strawberry crop.

Effect of Manure.

The yield of the last part of the season's crop, can be largely increased by working the soil and feeding with some fine manure and giving abundance of water, this could only be done to advantage by amateurs, as the labour of going over a large field would be too great. In a family plot, the season can in this way be prolonged, the yield materially increased. I know of no crop that can be grown in a family garden with so much satisfaction as strawberries.

Increased Growth of Strawberries.

To Mr. Dymond.—Our people are going into strawberry culture pretty largely, and we ship large quantities away. The county is suppled entirely by our home cultivators, and we have one who supplies most of the dealers in Stratford, and also ships all the way down to Toronto.

Raspberry Culture.

To the Chairman.—Raspberry culture is not followed very much, because we have so many wild raspberries in our district. The varieties which are successfully grown in our district are the Philadelphia, which is very productive; the Brinckles Orange, which is fair; Arnold's Diadem, good; Franconia, Clark, Kirtland, and Mammoth Cluster. We find them all hardy, and not liable to suffer from winter killing. We are in the habit of cutting back the canes to make them as bushy as possible, cutting them back about midsummer. No cultivated fruit finds its way to the market to any extent.

[*Mr. Allan.*]

Blackberries.

All the cultivated varieties of blackberries which we have tried are hardy in our district, and we have tested the majority of those generally sold by nurserymen. The one which is most esteemed is the Kittatinny. The canes bear well and regularly, and the berries are sought after in the market, and command a price of from ten to twelve cents readily. No insects seriously injure the plants.

To Mr. Dymond.—The supply is not equal to the demand. The wild berries are largely sold on the market. A wild berry, locally known as the thimble-berry is highly prized by housekeepers, both for preserving, and in a raw state. It is large, black, sweet, and so firm as to be an excellent shipper. I consider it the finest blackberry we have. The cane is hardy, and very rank and strong, and as a bearer, it is more prolific than any of the cultivated varieties.

Red and White Currants.

To the Chairman.—We grow red and white currants, but not very largely. The varieties most esteemed are the Cherry and the Grape currants. Their culture is profitable, I think, to a limited extent for the local demand, and there appears to be sufficient demand for the fruit. Red currants sell at seven cents per quart, and white at six. The bushes should be planted six feet apart. They are usually planted in our gardens around borders. The bushes are rank feeders, and require a rich mellow soil.

The Currant Worm.

The currant borer does not affect us at all; but we have the currant worm, which does a great deal of damage when allowed full sway. It is worse this year than for many years back. It is easily got rid of by the application of hellebore. We have seen no traces of the fruit worm.

Black Currants.

The black currants which are much esteemed in our district are the Black Naples and Lee's Prolific. The Black Naples is a splendid bearer, but Lee's is also a heavier bearer, and has a somewhat better flavour.

Black Currant Culture Profitable.

I think a larger culture of this fruit would be profitable, and I have advised cultivators to go into it. The fruit we raise is entirely consumed at home, and averages about ten cents per quart. For the black currant, I would recommend about the same soil as for the red, and it should be well-drained. I would plant the bushes about the same distance between the rows as the red and white. The bushes do not suffer at all from insect enemies.

Gooseberries.

We grow gooseberries for domestic use, and for the local market. The Houghton and Downing Seedlings are most esteemed, though we can grow the White Smith, and Smith's Improved, and I think they could be cultivated with profit. I have seen no traces of the mildew upon them. The price realized is from six to eight cents. The fruit sells best when it has ripened, though there is a limited demand once in a while for green berries. Some of the English varieties are subject to mildew with us.

Cure for the Currant Worm.

The currant worm generally begins with gooseberries, especially the Houghton and Downing seedlings, though we have no difficulty in destroying them. We have tried, be-

sides hellebore, unleeched or dry ashes and lime, and we find these remedies effective, though the hellebore is the best. I think the gooseberry does best in good stiff clay, especially the English varieties. Our other varieties would do on a loam soil. Some of the English varieties might be planted closer, but I would plant the Houghton, which spreads considerably, five feet apart, and the others say four.

Cranberries and Melons.

We have no cranberries in cultivation, though we have a few wild ones. There is a demand for all we are growing. Water-melons are grown by amateurs for family use. The varieties most esteemed are the Black Spanish, Mountain Sweet, and Goodwin's Imperial. The Mountain Sweet is the earliest to ripen. The crop would be, on the average, a profiable one for careful growers in field cultivation to supply the local demand. There is a ready sale for the fruit. Musk-melons are also cultivated by amateurs, the variety most esteemed being the Nutmeg, which sells best. The borer is not destructive to the fruit. Melons require a rich, warm soil. No insects that I know of are injurious to them.

Dessert and Cooking Apples.

Of apples that are most esteemed for dessert purposes, there are the Red Astrachan, Early Strawberry, the Summer Pearman, Early Joe, the Primate, and the Summer Rose; for cooking, the Keswick Codlin and the Red Astrachan. These are the summer varieties. Of fall apples we prefer for dessert the Fameuse, St. Lawrence, Porter, Melon, and the Gravenstein; and for cooking, the Alexander, Beauty of Kent, and the Hawthornden.

How to Pack Choice Varieties.

If I were packing choice varieties of apples for a foreign market, I would wrap each apple in tissue or manilla paper, and I would line the barrels with some good stiff paper, such, for instance, as common, spongy, thick, brown paper, used for heavy wrapping. I think that the additional price realized would more than compensate for the extra care. For general shipment I would pack them in barrels in the usual way.

Varieties of Plums.

The varieties of plums most esteemed for amateur growth, are Coe's Golden Drop, Fellenberg, Pond's Seedling, the Gages, Huling's Superb, McLaughlin, Washington, Peach, Yellow Egg, Jefferson, Smith's Orlean's, Lombard and General Hand. We have a few growers of the McLaughlin, but it is not as highly esteemed as it used to be by some growers. The General Hand is not a very good bearer. Smith's Orleans is considered a very heavy and regular bearer.

Peach and Cherry Growing.

Peaches thrive best on plum stocks. Cherries are grown on both mazzard and mahaleb stocks, and they succeed well on both.

Grapes for Amateurs.

Of grapes for amateur culture I would prefer the Delaware, Concord, Brighton, Salem, Wilder, Clinton (wine), Crevelling and Allan's Hybrid. Some of the newer varieties promise well, and in a few years I fancy a complete change will take place in amateur growing. Some mix the Clinton and the Crevelling together for wine purposes. The Hartford Prolific usually comes in the earliest of any, and the Concord also comes in in good time.

[*Mr. Allan.*]

Methods of Cultivation.

The sub-soil of the land for grapes should be well drained, and the soil worked the same as for a crop of roots. If the grapes were in rows I would make the rows nearly eight feet, and the vines fully twelve feet apart. A less distance would do, especially with some varieties, but nothing is lost by giving them good feeding and breathing room. Generally we grow the vines on trellises, but a few grow them upon poles with pins driven through, so that they project about fifteen to eighteen inches on each side of the pole. Many grow them along fences, on galvanized wire.

Systems of Pruning Grapes.

We have various systems of pruning. Some grow two arms while others grow three, so that one can be cut out, and while two are bearing a third is making, and when this comes in another is cut out, and so on. Others grow arms, and follow the renewal system by canes grown from these arms. I prefer pruning in the fall, after the fruit is gathered; others prune in March, and advantages are claimed for both systems.

Manure for Vines.—Aspect.

We have used no special manures for grapes, well rotted stable manure being that chiefly used. Wood ashes gives a strong, clean growth. One of the most essential points is to stir the ground often. I prefer a south-eastern aspect for a vineyard.

Age of Bearing Vines.

If strong, hardy year-old plants are used some will bring in fruit the third year after planting, but the fourth year is generally soon enough for a good crop. There is not much wine manufactured in our district, only amateurs making it for family use.

Cultivation of Strawberries.

A good, well cultivated, mellow soil is most suitable for the growth of strawberries, but they will succeed on various qualities of soil, so long as it is well worked up. Some small growers increase the last part of their crop by working the soil after the first berries have ripened. If it is dry weather the plants should be well watered. The vines may be planted either in the spring (when they will give a full crop next year if well taken care of), or they may be potted from runners in August, in which case they will give a fair crop the next year, and a full crop the following year. For field cultivation I would leave sufficient space between the rows to permit of a horse scuffler being used. In the rows the plants should be fifteen to twenty inches apart. Some put them twenty inches and let them renew themselves between the plants, taking out old ones and leaving the new. The chances are, however, that the new crop would not give so good a yield as the old one, the distance being too small to allow the new plant surface food enough to produce a crop equal to the older plants. Strawberries feed from the surface soil only, hence the necessity of a frequent change of the bed. The hill system of culture does very well for amateurs, but when profit is looked to, the row system is best, as it gives a much larger average crop, although not always such large berries. I think the vines should be renewed after two full crops.

Bee-Keeping.

Bee-keeping is increasing in our district. It is largely carried on by amateurs, though many of our gardeners and farmers raise their own honey. We have one apiary which has somewhere between 60 to 100 colonies. The owner of this farm has shipped hives down as far as Charlottetown, Prince Edward Island. He uses the Italian bees ex-

clusively as he thinks they pay the best. He considers the white clover as one of the best of honey flowers. He also favours the basswood blossom.

Honey.—Bee Management.

The local market price is 20 cents per pound for extracted honey, and 25 cents for comb. Bee-keeping can be made profitable in our district, as we have a very large area of clover. Italian bees are preferred because they work upon red clover; they work faster than black bees, and upon many flowers that the black do not. Italian bees are also more gentle to handle and cast better swarms and are more prolific than black bees. A good stock will cast one swarm and produce an average of 40 pounds of honey. It is found profitable to use artificial comb. We use the Fisher hive altogether and prefer it to any other, as it protects the bees in winter and is very handy generally. The bee moth and common ant are the only insects that we find injuring our bees, but the Italians usually destroy the moths. We have not had any cases of spring dwindling, owing, no doubt, to the fact that the Fisher hive affords such ample protection.

Forestry.

Our district is being pretty well denuded of its original forest. Very little pains have been taken to leave trees for the protection of farms; in fact, that question has not been considered by farmers. The farmer chooses his land, selects a position for his house, and clears the front of his farm, and leaves his woodland at the back.

Tree Planting.

Nothing has been done in the way of planting trees on a large scale. Nor has anything been done by townships to encourage tree planting. In the Town of Goderich our Council passed a resolution (which stands yet), offering twenty-five cents for every tree planted and successfully grown for three years. This has not accomplished much, owing to the trouble we have in animals being allowed to run at large. Nobody takes decided steps to remedy this evil for fear of popular disfavour, as a cry of "the poor man's milk" is immediately raised. Universal experience goes to show that crops are protected and benefited by a proper screen of forest trees; but if this screen is too wide or dense to allow a free passage for air, the crop is apt to be injured.

Wind-Breaks.

It is very often the case that the farmer leaves a stretch of woodland on two sides of his farm, in which case the grain that is grown in the angle, between the two sides, is likely not to head out properly. For the purposes of wind-breaking, I would advise the planting largely of deciduous trees, and they might be planted so as merely to break the wind rather than to prevent the wind from passing through.

Forests in Huron.

In the County of Huron there are 369,519 acres of bush land. Along the lake shore the prevailing soil is light. Our bush land is composed largely of maple, beech, elm, ash, hemlock, basswood, birch, cherry, ironwood, butternut, willow and sumach, with occasional specimens of oak, hickory and larch. Cedar and pine are scarce. Farmers are taking better care of their woodland of late years; they use all fallen timber for wood.

How to Plant a Forest.

In planting a forest, I would recommend planting far apart those varieties that would require age and large size to make them valuable for manufacturing purposes, and

while these are growing, other varieties, such as hickory and elm, could be planted between them and cut out in about six years or less for crockery crates, hoops, etc. Any of our native trees can be grown from seed by following nature closely, and sowing the seed in leaf-mould, when ripe, and keep well shaded until the plant is a few inches high, when it can be transplanted easily. These seeds require only a very light covering, a handful of light moist leaf-mould will be ample, if sprinkled, so as just to cover the seed and no more.

Screens or Belts.

Tree screens or belts are valuable on farms to break the force of winds and frost, as shade for live stock, and hiding places for the birds. Norway spruce makes the finest close screen; it would suit finely around an orchard and barn-yard. Maple and elm are rapid growers, and make beautiful screens for grain fields as well as suitable for road planting. I would prefer an assortment of hardwood trees for a road or street alternated. I believe forests have an effect upon the rain fall, so far as an equal distribution of the rain is concerned, at all events. A 100-acre farm, with roadways planted, screens along fences and around buildings, would be worth a third more than if left without these.

A Stock Law Needed.

To Mr. Dymond.—We have very few actual wind-breaks in our part of the country The first question to be settled in regard to extensive forest tree planting, is to devise some means of preventing animals running at large in our roads and streets. I don't think anything can be done until that question is disposed of. It would then seem to follow, to my mind, that forest tree planting would go on, as every man owning a plot of land would be anxious to beautify it and render it more valuable, by planting trees on and around it.

Beautifying School Lots.

I think, besides, the land around our school-houses could be utilized for the purpose of encouraging a taste for tree planting among the children. As a general rule, in our county, cattle and sheep are allowed to run at large.

How to Encourage Tree Planting.

Many methods can be suggested, the adoption of which would encourage the planting in the Province. Some would make it compulsory to do certain planting on or about every farm or plot of ground. Others prefer offering good premiums, believing that an appeal to the "money value" would prove the most effectual. I think, upon the whole, that more can be done of a permanent nature by educating our children properly, so that they acquire a proper knowledge of forestry. It would be of vast benefit if our young men were thus educated, and by introducing a suitable work, covering the subject, into our schools, the matter would be easily accomplished.

Local Agricultural Societies.

We have a West Riding Agricultural Society, and the Goderich Horticultural Society. The latter is a pretty active society, the members who take an interest in it being chiefly from the town. The Agricultural Society has taken no steps to go into improvements in farming, except by its shows. We have done nothing to promote forestry.

Drainage of Farms.

We have been considering the matter of drainage, and find that many of our farmers have been going into it themselves very largely within the last three years.

[*Mr. Allan.*]

The Tile Drainage Act.

It is not an uncommon thing for farmers to mortgage their farms for the purpose of carrying on drainage, and I have heard of some of them taking advantage of the Tile Drainage Act; but I think most of the drainage is carried on by private means. I have heard the merits of the Act discussed, and find that it is variously spoken of. Farmers generally express the opinion that there is too much red tape—too round-about a form to be gone through before the money can be obtained. Farmers generally prefer getting what is called a "straight loan." Of course, under the Act, they get their money much more cheaply than they could otherwise; for while they pay the Government only five per cent., money will cost from seven to eight per cent. if obtained from other sources. Farmers are using both tiles and slabs in draining.

Improvements from Drainage.

I have noticed marked improvements in a great many farms, especially in the Townships of Goderich and Colborne during the last few years as the result of drainage; and the owners of them say that it has increased their crops largely. They have drained mostly on low lands and cold clay bottoms. Such lands yield largely when drained. Another effect of increased drainage has been to accelerate the work of the year by allowing farmers to go on the land earlier in the season than formerly. I have no statistics of the results of drainage, but I think they might be obtained if desired. I think the collection of such statistics and information should be part of the work of the local associations.

Grants to Local Societies.

I don't think the associations are giving anything like value for the grant they get. In the first place, I should say, that the grant should be withheld altogether from the township associations, and only given to the larger bodies. For a few years yet, I think, the electoral divisions would be the best division for the societies. I hardly think the time has come for county shows. The chief objection that can be brought against the electoral division societies at present is, that their exhibitions, and correspondingly their benefits, are confined to one point in the division, and I think the law, in that respect, should be changed. The way in which the present law works makes the Riding exhibitions nothing more nor less than a local exhibition. If the law were to make it compulsory that the shows should be held alternately in different leading points in the Riding, I am certain the advantage accruing from the exhibitions would be very largely enhanced.

Defects in Present Arrangements.

At present the exhibitions are generally held in one corner of the division, probably in the largest town, and the membership is so large from the town that it can usually control, at will, the vote of the society, and keep the exhibition in one place from year to year. The result is, that those not immediately within the small circle around town take no interest in the society, and don't exhibit. The political and municipal centre of the Riding is not always the geographical centre, and, therefore, not always the most convenient place in which to hold an exhibition. The idea should be to give the whole Riding the benefit of the grant. The exhibitions in our Riding are now held in Goderich, and by the votes of members we can hold it there just about as long as we please. If we found that combinations were being made outside to out-vote us, we could immediately get all our relations—including women and children—to become members of the association, and thus hold our control over its affairs. I think the shows should be held in our Riding, in say Clinton, Wingham and Goderich, in annual rotation. I think Parliament should make it compulsory that the Riding exhibitions should be held at such leading convenient places within the Riding as would give the entire Riding the benefit of the grant.

[*Mr. Allan.*]

Use of Phosphates—Other Fertilizers.

Some of our farmers have used phosphates from the establishment of a Brockville company, as fertilizers. They give various opinions as to their merits, but generally they go back to barn-yard manure. I am familiar with the use of salt as a fertilizer on a large scale. It is being largely used by our farmers. We do not look upon it exactly as a fertilizer in itself—that is, as adding any particularly necessary elements to the soil—but rather as purifying it, and bringing its elements into activity. It helps to bring into activity everything in the way of vegetable life. Ours is the great salt producing region of Canada.

Price of Salt.

We can buy the common refuse salt at $2 per ton, though sometimes $3.25 and $3.50 have been paid by farmers. These prices are the prices at the works, but I could not say what it would cost at Toronto.

Effects of Salt on Crops.

Good results have been obtained from the free use of salt; those who have had the most experience with it saying that they would not be without it on any consideration. It is claimed that it makes the straw cleaner, while the heads fill better, and the berries are more plump. Others say that in connection with drainage it has a good effect in preventing rust. So many experiments have been made by our leading agriculturists, and made with such care, that I think they are justified in coming to the conclusions I have stated as to the effect of salt upon land. They do not say that it is an actual preventive of rust, but, rather, that taken along with thorough drainage the chances of rust are lessened. I think it would be a good thing to get the opinion of some of our leading farmers who have made this experiment.

Advantages of Salt.

In a dry season salt gathers moisture from the atmosphere and retains it well in the surface of the soil where vegetation is benefited mostly. Salt will be found to act upon some soils much the same as a strong tonic does upon a sluggish human system, the stronger substances in the soil are dissolved and assimilated with the other portions, and hence, I have frequently observed, when experimenting upon a field with salt, that the part salted gave a much more evenly distributed crop, stalks being almost all of a uniform height. The joint worm does not prove so destructive where salt is used. I would not recommend the use of salt unless in very small quantities, upon stiff clay land, as it would have the effect of caking, but on other land it can be used, with vast advantage, at the rate of from 200 to 600 pounds to the acre. Old pastures can be revived wonderfully by the light application of salt; about 50 to 100 pounds to the acre would be sufficient. The effect of salt upon the soil will be better understood by taking a small quantity of "dead" earth from the bottom of a well, or some such depth; put a little of such earth in two flower pots, and put a tablespoonful of salt in the one and mix well; let both stand for a few days, and then sow seeds in both; the seed in the salted earth will spring up and grow rapidly, while the other will either rot in the earth or grow weakly and drag out a sickly existence, giving very little or no results. Salt used in flower beds has a very fine effect, the colour of the foliage is more clearly green, the bloom is larger and the colours all deeper and richer. There is no cabbage so delicious as that grown in soil well supplied with salt; melons show very clearly the advantages of salt, they reach maturity sooner and grow larger. Fruit is much cleaner, richer and clearer in colouring where salt is liberally used in the orchard, in fact all vegetation is benefited by the use of salt.

[*Mr. Allan.*]

Huron Salt for Dairying.

Huron salt is generally used in our district for dairy purposes, though I have heard of some persons using English salt in preference. The question as to which is the superior article of the two for these purposes has been disputed largely at Dairymen's Conventions, Granges, etc., and it is a matter of dispute at the present moment. In the Teeswater creamery they have used both, and I think they are now using our salt exclusively. There is a large amount of butter made in our district, though there are not many creameries. We have many cheese factories, and they mostly use our salt, and from my information the question is not so much one of the inherent qualities of the salt as of the care taken in its manufacture. That seems to be the general conclusion.

Salt Manufacture.

It is thought that possibly there is something lacking in the system of manufacture pursued by some of our salt producers; that perhaps any faultiness in the article is due to its being drawn from the brine pans with large instruments made for the purpose and then thrown down into the bins without thoroughly drying first. Our salt is generally admitted to be the purest article, naturally, that can be had, and any impurities that are to be found in the salt, when it is taken from the earth, are attributed to leakage from above into the salt strata.

Rock Salt.

We don't supply rock salt to the farmers. One man commenced mining it on a large scale, but he has since stopped. I think it would be a good thing if the question should be decided by thoroughly reliable men, especially in the curing of cheese and butter, tests being made, say upon Huron salt, American salt (both Saginaw and Syracuse), and English salt. There are certain classes of English salt that are used almost exclusively for these purposes. I have heard it said that our salt, made for dairy purposes, was too fine; that it should have more grain. The salt we send to the United States is largely used in Chicago for pork-packing. In giving these opinions I am fortified by the opinions of others with whom I have conversed in the different parts of the county and district. Above our salt deposit there is a stratum of limestone, and, no doubt, a good deal of this finds its way by drainage through fissures into the salt bed, and hence will come up in the brine. Before running the brine from the tanks into the pans it should be allowed to settle well, so that these foreign matters might go to the bottom.

Prejudiced Statements.

I believe that a good deal of prejudice exists unjustly against Huron salt, caused, doubtless, by the many injurious and untrue statements made from time to time by those interested in the sale of the English salt. Where fault can be found in butter or cheese cured with our salt I believe it should be laid at the door of the curer and not blamed to the quality of the salt in most cases.

A. M'D. ALLAN.

[*Mr. Allan.*]

Sittings to take oral evidence, held at Chatham, July 22nd, 1880. *Present*—Mr. W. SAUNDERS (Chairman), and Mr. DYMOND.

EVIDENCE OF MR. WESTLAND.

Mr. H. W. WESTLAND, of Ridgetown, was called and examined.

FRUIT CULTURE IN KENT.

To Mr. Dymond.—Ridgetown is situated in the Township of Howard, in the eastern part of the County of Kent, and about five miles from Lake Erie. The Township of Howard runs south to the lake. I have been brought up to fruit growing all my life, and have been connected with Agricultural and Horticultural Societies since my youth. I am an amateur horticulturist and have given constant attention to the growth of fruit. I have been in this district for the last thirty years and am conversant with the cultivation of apples, pears, peaches, grapes, plums, apricots, nectarines, strawberries, raspberries, blackberries, gooseberries and currants. We can grow in our township all the fruits that can be grown in a temperate climate. If the whole acreage of peaches, plums, and apples were represented by 100, apples would be 95, peaches 4, plums 1. About 50 per cent. of the trees, or more, are in full bearing. Apple trees usually begin to bear plentifully at from six to ten years of age. I should say that about one four-hundredth part of the whole fruit area is occupied by small trees. I have no means of knowing the quantity of apples produced in the county. They consist chiefly of winter sorts.

APPLE GROWING.—SOIL—ASPECT—DRAINAGE.

Sandy loam or gravel, with a porous sub-soil, is the best soil for apple growing. I think it is important that the sub-soil should be sufficiently porous to be well drained. I think a southerly aspect is the best for an orchard. Apples should be planted 30 feet apart; peaches, 15 or 16; plums, the same; pears, 20 feet; and cherries 18 feet apart each way. Of summer apples the Astrachan and the Early Harvest are the most profitable. Taking one season with another, summer apples realize from $1 to $1.50 per barrel. exclusive of barrel.

DISPOSAL OF SURPLUS APPLES.

We don't ship any summer apples from our neighbourhood. A portion of them are fed to stock and a portion dried, though there are not so many summer apples dried as fall apples. We have no establishment for drying the fruit, the drying being done in the usual way by farmers. Of fall apples the Cayuga Redstreak, the St. Lawrence, the Fameuse, the Seek no Farther, and the Fall Pippin are the most profitable. We don't grow the Gravenstein to any extent. The price of fall apples is about $1 a barrel. The varieties I have named are all equally hardy in our section, and I don't think there is much difference in their productiveness. The present supply of fall apples is in excess of the demand, and the surplus crop is dried. No fall apples are shipped from our township that I know of.

WINTER APPLES.

Of winter apples the favourites are the Greening, the Baldwin, the Northern Spy, the American Golden Russet, and the Yellow Bellflower. We do not grow the Bellflower so largely as the Greening or the Baldwin. Our winter apples are shipped largely to the Chicago market. Of those adapted for shipping the Greening stands at the head of the list; the Baldwin next; then the American Golden Russet. The bulk of our winter apples are shipped east, and I think a portion of them find their way to England. The varieties

I have named are also the most profitable for the home market; they sell at $1 and $1.25 a barrel, including the picking and packing. The grower is furnished with the barrels and he has to deliver them at the station. I have no idea what quantity is shipped from this section.

Seedlings—Blight—Borers—Codling Worm.

I don't know of any good seedlings cultivated here that are not generally known. We have a slight blight this season. We had some trees blighted years ago with us. The blight does not extend to the larger limbs of the trees, and we have taken no pains to remedy it. The borers are not destructive to healthy trees, but if the tree is diseased they are apt to attack it. I cannot say that I have watched their operations very closely, but my idea is that the borers attack those trees which are somewhat scalded or bark-bound, and that the insects prefer such trees for depositing their larvæ. I have found the larvæ in spots affected in that way. The codling is not very plentiful with us, not sufficiently so to affect the commercial value of the crop very much; still buyers do not care to take fruit which has been affected by them if they can help themselves. I have adopted no remedy for either the borer or the codling worm, except to turn the pigs in to eat the fruit which has been affected by the worm. I have frequently cut the fallen fruit open, and found that it did not contain worms at all.

Cultivation of Orchards.

I cultivate a young orchard with a hoed crop until it comes to full bearing, being very particular to keep it clean, because weeds and rubbish are favourable to insects. I would cultivate so long as there was sufficient light and air for a hoed crop and then I would seed down.

English Markets.

To Mr. Dymond.—The bulk of our apples go east, and I don't think that they find a foreign destination. I don't think any of our fruit growers have taken any pains to develop a foreign market, though we have been planting what we considered the best varieties for the English markets. I think the varieties I have named would be the best for that market, but the question of finding an outlet in England has not occupied my attention. I know that in the United States certain apples are selected and carefully packed for the English market, principally I think the Green Newton Pippin. I think we can grow it here. Our neighbourhood is well adapted for growing high-class apples. We grow the Ribston Pippin, but it does not crop well.

Pear Culture.

To the Chairman.—We grow pears successfully. The clay loam is preferred for the pear tree, but it will do well in almost any soil. Not more than 50 per cent. of the trees in the pear district are in full bearing. There has been fully more activity displayed in planting pear trees of late than apple trees.

Favourite Pears.

The favourites are the Bartlett, Clapp's Favourite, the Autumn Pear, the Flemish Beauty, the Bonne de Jersey, the Duchess d'Angouleme. I don't think the birds are worse upon the Duchess than upon the other varieties,—the Flemish Beauty suffers a good deal. The Bartlett and Clapp's Favourite should be picked while yet green, and laid away carefully, the result of allowing Clapp's Favourite to ripen on the tree would be that it would decay in the centre. The most profitable varieties, I should say, are the Bartlett and Clapp's Favourite. We succeed best with standard trees. Our pears are all consumed in the neighbourhood. The average price realized, per bushel, is about $1.50.

[*Mr. Westland.*]

Picking—Blight—Borers—The Slug.

I think all pears should be gathered before they are fully ripe, and allowed to mature indoors. The tree is not much subject to blight with us, in fact, we have had no blight worth speaking of, if the borers do not attack our trees, but we have been troubled with the slug; sometimes its attacks on the Bartlett pear have been quite a drawback, though there is no great difficulty in dealing with it—ashes, hellebore or lime will kill it, but hellebore is the most effective.

To Mr. Dymond.—I know that the blight is a serious enemy to pear culture generally. I have been growing pears for the last twelve years. I have no theory as to the cause of our exemption from the blight. Our pears grafted upon quince stock, have died out after one or two full crops. The leaves turn yellow and drop off. Sometimes the fruit drops off, but I do not look upon that as the blight. Sometimes the trees will put forth a few leaves next season, but not always; we have tried mulching, but it does not seem to be effectual.

Plums—The Curculio.

To the Chairman.—We cannot grow plums to any extent on account of the curculio. We have partial crops every year, but the crop is not generally regarded as a success.

To Mr. Dymond.—I think fighting the curculio would cost more labour than would be remunerated by the success of the crop, unless we had some hope of killing them out altogether. Efforts have been made for that purpose, and with good success. I think the crop would pay for the labour of jarring the trees.

To the Chairman.—I think if the fruit-growing public were generally to adopt this plan, the fruit might be secured, and the growers find it profitable.

No Black Knot.

To Mr. Dymond.—The district is well adapted to the growth of that fruit. I have never seen the black knot.

Peach Growing.

To the Chairman.—I grow a good many peaches, and they are grown with profit in our district; the trees stand the winter very well of late years. A number of years ago we had some winter-killed, but not within the last twelve or fifteen years. Sometimes the fruit buds are injured, even when the trees survive; of late years we have got very regular crops of peaches. The varieties which ripen earliest are the Alexander, Hale's Early, and the Canada Early; the last-named is a new seedling from Grimsby, which has fruited this year for the first time. I think the Alexander is the most profitable of the early varieties, but the Crawford is the most profitable peach of all. The local demand is not sufficient to consume the crop, and we ship the surplus east. The price is usually from $1 to $2 per bushel.

Curculio—Borers—Soil.

We have not suffered at all from the yellows, but the fruit suffers slightly from the curculio; the trees have suffered pretty badly from the borers during the last few years. We tried to kill them by picking them out, and by applying ashes in a little mound at the collar of the tree. There are no other insects troublesome to the peach. The trees should be planted in sand or gravelly soil.

A New Seedling Peach.

We have one seedling peach in cultivation, but we have no name for it; it is a yellow peach, with red cheek and yellow flesh, and is of fine quality. The tree is very tough and hardy, and generally produces its own kind. I have grown it from the seed several times.

[*Mr. Westland.*]

It is not a large peach; it is about the size of the Hale, and has a very fine flavour. I think the tree is the hardiest of any variety of peach I know of; the foliage is small and dark, and the wood is a dark black; we have taken no means to propagate it.

To Mr. Dymond.—The people in our district are growing this particular seedling, and there is one orchard in which there are quite a number of trees, which have been bearing for a number of years; it originated, I think, with Mr. Edward Tyhurst; no steps have been taken to make it known, except in that neighbourhood. I am not a member of the Fruit Grower's Association, and I don't think that any steps have been taken to let that body know of its existence. I think the originator was at one time a member of the Association, but I cannot say whether he made the seedling known to them or not.

To the Chairman.—The fruit ripens about ten days later than the Early Crawford.

To Mr. Dymond.—Peach culture is increasing in our district; the business is found to be profitable, and the demand for good fruit unlimited. We make a point of shipping the best fruit.

Apricots and Nectarines.

To the Chairman.—Apricots and nectarines are only cultivated by amateurs. I have never seen the nectarine ripen; the tree fruits, but the fruit drops, as it is attacked by the curculio worse than any other fruit. We ripen the apricot well, and it is not nearly so liable to the curculio as the nectarine is. I don't think the trees are subject to any other pest. Sometimes some of the finer varieties are killed back in the winter.

To Mr. Dymond.—The apricot is not cultivated on a large scale, but I don't know any reason why it should not be more extensively grown. There would be a good demand for the fruit.

Cherry Culture.

To the Chairman.—We can grow the common cherry profitably, and we can also grow all the well-known varieties. Very few are grown except the common Kentish cherry. The reason the other varieties are not extensively grown is that the trees do not stand. I do not know what stock has been used. The price we get for the common cherry is about five cents a quart. The crop is all consumed at home.

The Curculio—The Slug—The Birds.

The curculio injures all varieties of the cherry, and the slug is also destructive. The fruit is not subject to the rot, but the birds are somewhat troublesome. Those most destructive are the robin and cherry-bird. I think, however, the robin well deserves all the cherries he eats. I have seen robins carrying grubs to their nests, such as cut-worms. I could not, of course, be sure that they eat injurious insects, because I did not examine their stomachs. The cherry tree succeeds on ordinary soil without any difficulty. We have no seedling cherries.

To Mr. Dymond.—The robin has a decided appetite for fruits in general, and he devours a good many cherries. I never saw them on the trees in flocks, but the old ones take the cherries to their young. They also take the strawberry and the raspberry, though not to any extent. They devour a few grapes. On the whole the robin with us is reasonable in his ravages. I have never found them eating insects or caterpillars, but my impression is that he eats the cut-worm. I think he takes other worms, but I have no evidence of it.

Quinces.

We grow a few quinces, principally the large orange variety. They are chiefly grown by amateurs, and not to any extent. They find their way to market, and there is a demand for all that are grown. The quince could be cultivated more extensively with profit. The price realized is about two dollars per bushel.

[*Mr. Westland.*]

Vineyards.

Grapes are considerably cultivated in our county. The varieties which succeed best are the Concord, the Delaware and the Clinton; we have also found Rogers' varieties succeed. The Delaware and the Concord are the best for shipping, and the Clinton for wine. There is not a great deal of wine made, though we have one man who manufactures his whole product. We have no difficulty in growing grapes on our high, dry land. Our surplus is shipped to various points in Ontario, and realizes us from four to eight cents per pound. I think grape culture is profitable at these prices, and might be extended a good deal more than it is, without danger of crowding the market. If grapes are planted on high, dry land, they seldom suffer from frost, but they do suffer occasionally on low land. The heavy frost of May 1878, did not injure any of our grapes planted on the high land. The vines are not subject to insects or diseases.

To Mr. Dymond.—I heard Mr. Toll's evidence with regard to grapes. I do not know that all the varieties of grapes grown in Canada are cultivated in our district. Rogers' hybrids are very successful with us, but we cannot get the same weight of grapes from them that we can from the Concord. I cannot say whether the higher prices obtained for them would compensate for the smaller crop. The Catawba doesn't ripen with us. I have ripened it to a small extent when grown on the side of a house.

Strawberries.

To the Chairman.—We cultivate strawberries but they are not much grown. The varieties most esteemed for home consumption are the Triomphe De Gand, the Monarch of the West and the Col. Cheney; for market, Wilson's Albany, and the Monarch of the West. I think the Monarch of the West produces equal to the Wilson, and is as good a shipping berry and equally hardy. It is a large berry, and with us is very firm; it also carries well. In favourable seasons the average yield would be about 200 bushels to the acre. The fruit sells at from 8 to 15 cents per quart. We do not get any more for the finer varieties than for the Wilson. I would not recommend the Triomphe De Gand for general cultivation. We do not find any insect injurious to the plant, but the white grub occasionally troubles us a little.

To Mr. Dymond.—Strawberry culture in our district is on a small scale. We have facilities for shipping berries for consumption in Canada.

Raspberries.

To the Chairman.—We do not cultivate raspberries to any extent; but as the wild berry is getting scarce, people are going more largely into the cultivation of the fruit. The varieties chiefly cultivated are the Philadelphia Red, Davison's Thornless, and the Mammoth Cluster. We have Brinkle's Orange, but it is not bearing. We have also another berry—a yellow one—with thornless bushes, but it is a poor fruit though very productive. The canes do not suffer much from the winter's cold. The fruit sells at from 10 to 15 cents per quart for red raspberries, and from 8 to 10 cents for blackcaps.

Blackberries.

Of the blackberries we cultivate the Kittatinny and the Lawton—the latter is quite hardy. We also grow the Wilson, and we find it hardy. The fruit is sweeter and better than the Lawton, but not so large.

Red and White Currants.

We grow red and white currants—principally the Red Cherry, and the White Grape varieties. I think their culture might be made profitable. These varieties sell at from five to eight cents. The currant borer does not injure the bushes.

The Currant Worm.

The currant worm is injurious, but we easily dispose of it by using hellebore. We have not had the fruit worm of late years, but it used to attack our gooseberries. I cannot account for its disappearance.

Black Currants.

The black currant is considerably cultivated. The varieties most esteemed are the Black Naples, and the English Black Currant. I think the culture of this fruit is profitable. The crop is all consumed at home, and sells at about eight cents per quart. They will grow on almost any soil, though their preference I think is for a clay loam. The bushes do not suffer from insect enemies.

To Mr. Dymond.—The growth of currants with us does not amount to anything considerable; there is no wholesale cultivation of them, but they are grown by amateurs. The same remark applies to gooseberries and other small fruits, though they are being more largely cultivated than heretofore. Some of our farmers are beginning to do something in this direction, and others are making a business of it. There is a tendency towards the development of the cultivation of these small fruits, and I think they will be successful.

Gooseberries.

To the Chairman.—The gooseberries which succeed best are the Houghton, Smith's, and the Downing, and I don't know that there is a great deal of difference between them. Mildew does not affect them; but we tried the English varieties and it attacks them. We have planted the gooseberry on almost all soils—clay, gravel, and sandy loam. We have not tried the White Smith. The American varieties have resisted the mildew. The fruit sells best when it is green.

Cranberries.

Cranberries are not cultivated with us; there used to be plenty of wild ones, but, the swamps having become drained, there are very few now. It has not been suggested that we should cultivate them, though it is done on a large and successful scale in some parts of the United States.

Melons.

To the Chairman.—We do not grow water-melons to any great extent, but I think the crop could be made a successful and profitable one. The Mountain Sweet succeeds best with us. Musk-melons are grown to about the same extent as water-melons.

Bee-keeping.

To Mr. Dymond.—I only keep bees in small numbers. We have some pretty large bee farms, and the demand for the product is increasing. The tendency of our district is progressive in respect to bee-farming; and I find that the farmers are making a more intelligent application of knowledge upon these subjects than formerly. There is no prejudice against the Fruit Growers' Association in our neighbourhood; and I think a closer communication between the Association and us would be a desirable thing.

Tree-planting

Trees have not been planted much in our district except for ornamental purposes. [*Mr. Westland.*]

Farmers have been planting them in front of their properties and in their fields; and they have also been planting some upon the side roads and concessions as well as upon the main roads. The planting is done independently of municipal encouragement. It has not been carried on long enough to have done anything in the way of reproducing the timber of the country. I think it is generally the custom to leave a few trees separately or in clumps when clearing the land. The information which I have given may be said to be true of the district which I represent.

H. W. WESTLAND.

Sittings at Chatham continued. July 23rd, 1880, *Present*—Mr. F. MALCOLM (Chairman), Hon. S. C. WOOD and Mr. DYMOND.

CHATHAM, *Friday, July 23rd, 1880.*

The Commission met at 9.30 a.m.

MR. EDWIN CADY'S EVIDENCE.

EDWIN CADY, of Kingsville, Essex County, was called and examined.

FRUIT IN THE SOUTH OF ESSEX.

To Mr. Dymond.—My business is engrafting and pruning, and I have had considerable experience among the fruit growers of the South Riding of the county of Essex, during the last seven or eight years. The South Riding is a very important fruit-growing section. Any evidence I may give will be not merely my own opinions, but will be given rather in a representative capacity.

To the Chairman.—Of the fruits which are grown in our district, the apple is most extensively cultivated; peaches come next; then come grapes, cherries, pears, quinces, and all the small fruits, such as raspberries, strawberries, currants, gooseberries, etc. I should say that 90 per cent. of the whole fruit grown are apples. Peaches would be about one-fourth, probably one-third, of the remainder. Plums are almost a failure with us, owing to the way in which they have been cultivated. The curculio is very bad with us, and the people have not had the patience to apply the remedies, and the result is that we have few or no plums. The black knot is wholly unknown in our section, and the curculio is the only obstacle we have to contend with in plum growing. Of all the trees that are planted I should say that one-tenth are in full bearing. Farmers have been planting rather extensively during the last five or six years. Apple trees usually begin to bear plentifully, or at least sufficient to pay for the cost of cultivation, say four or five bushels a tree, in ten to fifteen years from the bud or graft, or about six or eight years from the nursery. Of the cultivated land in the county about one-half an acre to every hundred acres is planted in strawberries, raspberries and other small fruits. In that list I do not include grapes, which would average perhaps three-fourths of an acre to every hundred acres. I think the shipments of apples from the Riding would be about 10,000 barrels. The South Riding consists of five townships on the mainland, and Pelee Island. The quantity shipped is rapidly increasing. There are not a great many summer or fall apples grown in the district; but three-quarters of the whole product, perhaps, are

winter apples. I would choose a dry sandy loam for apples, with a somewhat retentive subsoil. When we can get clay and gravel mixed we prefer it, as the trees bear more abundantly, and live to a greater age, while the fruit seems to be richer and to keep better during the winter. We prefer a south-easterly aspect for orchards; and we have usually planted our apple trees 30 feet apart. That however we find to be a mistake, as 35 or 40 feet is better. We plant standard pears 20 to 25 feet apart, and strong growing cherries the same. Duke and Morello cherries we plant 15 to 18 feet apart; peaches 12; quinces and dwarf pears and apples, 8 to 10 feet each way. The reason we now plant our apple trees wider apart than before is this: our soil will throw up such an abundant growth of wood that at the age of from 15, 18 or 20 years the trees will often measure 30 to 34 or 35 feet across, and the branches interlock, and keep the ground completely shaded. We require all the sunlight we can get into our orchards, and with such a superabundance of top it is impossible to get it if the trees are planted only 30 feet apart.

Fruit Markets.

To the Hon. Mr. Wood.—Until last season we shipped our fruit principally to Chicago; but last season we shipped some to Omaha. For winter apples we realize on an average $1.50 per barrel—last year we got a little higher prices than usual. They are all hand-picked; we can find no sale for any others. We have tried wrapping extra fine apples in paper, and last year these realized $2 per barrel.

Orchard Planting.

To Mr. Dymond.—Only about one-tenth of our fruit trees are in full bearing. That indicates a large recent addition to the land under orchard cultivation. It is about eight years since we began to plant so extensively. Up to that time the growth of fruit was comparatively small, and our apples were all consumed at home. I do not know what induced our farmers to go into the trade unless it was a growing spirit of enterprise. This extensive planting is still going on. The number of old trees is not very large, and there is not much occasion for the replanting of fruit trees. The increase has been principally in apple growing. We are growing some peaches now; but the increase in peach growing was much slower until about six years ago. Grapes are just beginning to be replanted. About ten years ago a great many of our people went extensively into grape planting, but they were deceived as to the varieties which they should plant, and the consequence was that they planted such varieties as the Diana, the Hartford Prolific, the Oporto, and the Clinton, and they found that they did not pay. The Clinton and the Hartford Prolific were the only kinds that would ripen, but being wholly unacquainted with their cultivation, and with the making of wine, they became discouraged and tore up all their vines; but recently they have been planting more extensively than ever. On the whole, in our district there has been a great and satisfactory increase in the fruit-growing industry.

Drainage Works.

To Hon. Mr. Wood.—We have some townships in which large sums have been expended in open drains. On those lands we can now grow some of the hardier varieties of apples, such as the Rhode Island Greening and the Northern Spy. We are growing the Fameuse, but not very extensively.

To Mr. Dymond.—We have a large area of land adapted to apple growing. Orchards should be well drained, though as a matter of fact many of them are not. The full benefit of the larger drains is not yet accruing, owing to the absence of many small drains.

[*Mr. Cady.*]

Varieties of Apples.

To the Chairman.—The sorts of summer apples most profitable are the Early Harvest, the Red Astrachan, and the Duchess of Oldenburg. The prices which I have mentioned would not apply to summer apples, which are scarcely sold at all. When they are sold, they realize about 25 cents per bushel, one year with another. None of them are shipped, but they are taken to the villages; and some are peddled around in those districts where they are not grown yet. Of fall apples we find the St. Lawrence and the Fall Pippin the best for early fall use, and the Fameuse and the Rambo for late fall and early winter use. These have sold at $1 per barrel, but I have never known them to sell for more. As regards hardiness, I do not think there is much difference; but perhaps the Fameuse and the Rambo are both the hardiest and the most productive. The St. Lawrence is also hardy. If the Rambo is neglected, it is apt to grow irregularly as to size, but we find that if they are properly cultivated and pruned they grow to an even size, and are a very fair class of apples. If not cultivated they are very irregular in size.

To Mr. Dymond.—The Duchess of Oldenburg is regarded as a summer apple with us—it is an August apple. We have no apples that we can safely calculate upon before the middle of July.

To the Chairman.—The varieties of winter apples most esteemed are the Rhode Island Greening, the Baldwin and Northern Spy; but lately a great many people favour the Bourriseau and the Red Canada. The latter is known by a great many names; the Michigan people call it Steele's Red Winter, and in the Eastern States it is known as the Old Non-Such of Massachusetts. The varieties which command the best prices for export are the Rhode Island Greening, the Baldwin, Peck's Pleasant, the Spitzenberg, the Red Canada, and the Northern Spy. I should have mentioned Peck's Pleasant before as it is a very popular apple. I have not noticed them anywhere else than in our locality. The Red Detroit is a new apple and has not been tested in our neighbourhood; and the Black Detroit we deem unworthy of cultivation. The Red Detroit is a large, fine-looking apple, conical in shape, with a fine glossy skin, and would measure as much as ten inches in circumference. Our best keeping apple is the Bourassa, and the next best is the Red Canada. We have also Russets which are good keepers, but we do not consider them as first-class varieties for market, though they are fine for dessert. The Pomme Grise is a fine apple, though it is rather small. Peck's Pleasant would come next; then the Northern Spy, the Baldwin and the Greening. We do not care much for the Wagener, as with us it is a hard woody-fibred fruit—not very palatable, though it is hardy and stands shipping well.

Packing and Keeping Apples.

Our usual mode of preserving apples is to put them in barrels or boxes, and store them in the cellar; but the best plan we have tried is to pack them in wheat bran. They keep longer packed in that way than any other. I have no doubt that wrapping them up in paper would be better still.

To Hon. Mr. Wood.—I do not approve of packing apples on shelves—they should be packed in barrels with bran. They require to be kept in the dark.

To the Chairman.—Along in the fall, after they are pulled, until the winter frost sets in, they should be kept in any cold out-house, or even in the open-air until it gets to quite hard freezing weather. Apples will stand a temperature of one or two degrees below freezing point—in fact that is the temperature we prefer for them. Generally speaking we find it safest to have the barrels or boxes left lying in the orchard under the trees until the hard freezing weather comes. If they are headed up in the barrels they will stand a pretty hard freeze; they will be safe even when water is frozen an inch and a half thick. After the cold weather sets in I would not put them in the cellar, because our cellars are generally too warm. We don't think of putting apples in the same cellar with potatoes and other vegetables, because if it is warm enough for the vegetables it will spoil the apples. I prefer an outbuilding or an unoccupied room in a house, so long as

[*Mr. Cady.*]

the temperature does not go much below the freezing point. The idea of building fruit-houses does not seem to have occurred to the people in our county yet. Of the whole amount of fruit raised I should judge that about one-half is consumed at home. We have no good seedlings. The standard varieties are all perfectly hardy with us. Our apple trees are not troubled much with any disease like blight. We have had a little blight, but not enough to be of material injury.

Insect Pests.

Borers do not injure the trees unless they have been wounded in some way or sun-scalded. We have not many tent caterpillars, and this year we have fewer than in previous years. The Codlin moth is not very prevalent in cultivated orchards, but in those which are seeded down it is a little troublesome. We have not tried remedies for any of these pests except tent caterpillars, and we find that strong soap suds will exterminate them. We wash the limbs thoroughly two or times in a season, and we find that the larvæ are destroyed in that way. We generally apply the suds with a pail and broom. I should prefer cultivating an orchard and never seeding it down at all.

Cultivation Beneficial.

To Hon. Mr. Wood.—I would cultivate an orchard, no matter how old it is; and I would also manure it either with ordinary farm manure, or, preferably, a mixture of equal parts of rotten straw manure, and leaves or other loose litter. We are not troubled much with the Codlin moth, and I have not noticed that it attacks any kind of apple particularly. I would recommend the construction of outside cellars for the purpose of keeping fruit, so that the heat might be regulated as required. I should build them wholly above the surface, and make them with large doors so that I could drive right through them. By that means not only could the barrels be rolled off just where they are required, but if the temperature is too warm the doors could be opened. A stove should be kept in the cellar, so that the heat may be regulated. I would recommend people with such cellars to keep as much fruit as possible till the spring, as the price is generally better then. We can always find a ready market in Detroit or Windsor for all the apples we can keep until the spring. I have known apples from our neighbourhood sell at $3 per barrel at Detroit in the spring.

Climate of the District.

To Mr. Dymond.—I think our climate is very mild when compared with other parts of Canada. The temperature seldom goes below zero—it very rarely goes as low as zero, though it is sometimes ten or fifteen degrees below zero in exposed situations, but that is considered extremely cold weather, and that only lasts a few hours. In situations where we plant orchards and have the fruit cellars I alluded to, the temperature is seldom as low as zero. I do not think there would be the least difficulty in preserving apples as I have suggested, in any part of Canada, as they can be more easily preserved in cold weather than in warm, owing to the greater facility with which the temperature can be regulated. The class of apples which we send to Chicago and Omaha are Rhode Island Greenings and Baldwins. The Red Detroit is a fine dessert apple, and I think it will be useful for shipment. I do not know that there has been any shipping of apples from our county to the old country. I should judge that the Red Canada, the Spitzenberg, and the Ribstone Pippin would suit the old country market. Peck's Pleasant should also bring a good price, as it is much the same as the Ribstone Pippin in flavour. We do not grow the Ribstone Pippin to any great extent—the trees do not yield very well. I know it is a very popular apple in England. We depend wholly on nurserymen for our trees, and do not pay much attention to raising new sorts. Birds are not troublesome to the fruit to

any serious extent. The woodpecker sometimes attacks the apples, but he also does good by eating insects. The robin never attacks the apples.

To Hon. Mr. Wood.—For my own growing I prefer dwarfs, but our people generally do not; they prefer standards with the limbs sufficiently high to plough under.

To the Chairman.—If the temperature should go down to 25° below zero in winter, I do not think the temperature would be too low to plant orchards. The trees we get from Rochester are as good as any, and as to growing seedlings, it would take a life-time before we could get any varieties that might suit us. We might grow a thousand trees and not get the one we required. I do not think grafting the seedlings on the top would make any difference. I do not approve of going much farther south than Rochester for trees—I would rather go farther north if possible.

Bark Lice.

So far as my experience goes, when a tree gets pretty well covered with bark lice, it might as well be destroyed. We can keep them off by washing the trees with strong soap-suds when they are young, or with lye made of wood ashes when they are older. We have never tried tobacco upon them. After they get into an orchard they will propagate from one tree to another. Bark lice are a pretty certain indication of an unhealthy tree.

To Mr. Dymond.—Where ground is valuable and space important, I would not object to hoed crops being grown in a young orchard, but after it is bearing fruit in paying quantities, it would be asking too much of the ground.

Supply of Trees.

The principal portion of the trees brought into our county are from Rochester, N.Y., and Monroe, Mich., as, until recently, we were not able to get a supply in Canada. We are now getting some from Fonthill, from Leslie, of Toronto, Beadle, of St. Catharines, and Moyer, of Jordan. The Fonthill trees are superior to any we have had from Rochester. We did not get trees from Rochester because we preferred American stock, but because we could not get Canadian trees. I think, as a rule, trees grown in Canada are quite equal to those which are imported. We have had some from Mr. Dougall, of Windsor, and years ago, Mr. Leslie, of Toronto, did business in our county. We find that trees in orchards planted from those two nurseries require less grafting than any other trees brought into the country, that is, they are generally true to the names under which they are bought. We have now to pay a duty of 20 per cent. on American trees; the duty was formerly 10 per cent. We get Canadian trees delivered to us at about the same price as American—duty or no duty.

To the Chairman.—I think trees will remain healthy after repeated grafting if only the small limbs are cut. Many who claim to understand grafting will cut the limb below where it has been grafted before, and the wound is too large to heal. You may notice in these limbs that if they do not heal quickly the pith or centre hollows out, the wax comes off, and the rain gets into the wound, and causes injury. Grafting may be done as often as desired, so long as the small limbs are taken.

Pear Growing.

I have cultivated a few pears. A neighbour of mine says he has a pear tree which has paid him from $15 to $20 a year for about fifteen years. The tree is about sixty years of age, and bears abundantly every year. It is a seedling, but has no name. Our pear trees are not much subject to blight, though they have blighted a little this year.

To Mr. Dymond.—Pear trees blight more in a light, sandy, porous soil than in a heavy soil. If the soil is a deep gravel we cannot grow pears. I think the Seckel and the Flemish Beauty escape the blight best; but the seedling I mentioned is never touched

[*Mr. Cady.*]

by the blight. No means have been taken to propagate the seedling, but I think it would be an advantage to do so. The tree is a very large one—about sixty feet high. I am not a member of the Fruit Growers' Association, and I think there is only one member in our neighbourhood. I do not think the Association have taken any steps to look up our district.

To the Chairman.—I should think that scions from the tree I mentioned would be as free from blight as the tree itself.

To Hon. Mr. Wood.—Our people do not exhibit largely at the Provincial Exhibitions—we have not exhibited more than two or three times. The seedling pear I spoke of is very sweet, and is often stewed without a particle of sugar. So for that reason it is called the Sugar Pear. The Seckel we consider about the richest pear we have. There are various causes for pear trees dying. Sometimes worms are found at the roots of the tree, but if the trees are taken up and the roots well washed in a tub of water when they are quite small, they will grow all right if replanted.

Plum Culture—Peaches.

To the Chairman.—Plum culture is very limited in extent, though I believe we could grow the fruit successfully if we adopted means of keeping off the curculio.

To Mr. Dymond.—It is only lack of energy among our people in keeping off the curculio that prevents us from raising plums. We have some seedlings—what we call wild plums; they are something like the Damson. They are not cultivated at all. We have no seedlings of any special merit.

To the Chairman.—Very few of our wild plum trees bear to any extent. We have every facility for growing peaches—good soil and good climate—and we can grow them very profitably. Our trees require a little cutting back to stand the winter well. They grow so rapidly that in extremely cold winters they are injured a little. When the shoots have grown from fourteen to sixteen inches long, in the month of June, I think their growth should be checked by pinching off the young buds, and the laterals which are produced in that way should also be pinched back. The trees will then exert their energy more in the formation of fruit buds. This plan should be followed with young trees, up to a certain age; then their habits become formed, and they do not grow so rapidly. The Amsden June ripens earliest, and the Alexandra next, and the Early Beatrice. We have planted the Early Canada, but we have not fruited it. The Early Crawford is the most profitable variety we have grown yet. The local demand is not sufficient to consume the crop, and a few are shipped, principally to Detroit, though last year some were shipped to St. Thomas. I could not say what quantities have been shipped. The yellows are unknown in our district, and our peaches do not suffer from the curculio. Borers are not numerous. No other insects are troublesome. We have one seedling which has been in bearing for twenty or twenty-one years, and has borne abundantly and regularly. The fruit will measure seven and a-half inches in circumference, and is nearly as yellow as an orange; there is no red upon its surface. There has never been a bud taken from it.

To Hon. Mr. Wood.—Farmers generally grow a few peaches; the trees are usually planted in fence corners, and the grass allowed to grow around them. They are generally grown more like a bush than a tree, and when they are fruiting the branches break, and the trees die, so that they are considered very short-lived. Peach growing is far more profitable than apple growing, though the crop is not quite so certain. For the last eight or ten years our trees have fruited nearly every year. I don't think there would be any danger of overstocking the market if we went largely into peach growing. I think peach growing is more profitable with us than general farming, and I would recommend its extension to our farmers.

To Mr. Dymond.—On the mainland we have only one or two orchardists, or men who pay particular attention to peach growing; but on Pelee Island we have quite a number. The island is well adapted to the growth of peaches and grapes. The pips of the seedling peach which I mentioned were planted, and they produced nearly the same

kind of fruit as the parent. The seedling is not much known outside of our district. I don't think the owner would have any objection to its being propagated, and I believe if it were, it would soon acquire a good reputation. It is finely flavoured, and I think it would carry well. Nearly all our peaches are consumed at home, but we ship to Detroit and St. Thomas in small quantities. If we get a good crop of peaches every third year we consider that the fruit pays.

Cherries—Quinces.

Cherries are not very extensively grown with us. They are grown by private individuals for their own use. We have none who go into the trade for the purpose of marketing. The Dukes and Morellos do very well with us, but not the Hearts and Bigarreaus. The Bigarreaus are the best shipping cherry grown. We have just begun to grow quinces to some extent. There is a good demand for them at good prices, and they might be more largely grown with profit. I would recommend the Orange quinces. For the last eight years they have realized, when taken to Detroit, from $2.50 to $5 per bushel. A tree in full bearing will yield from two and a-half to three bushels. They bear every year.

To Hon. Mr. Wood.—We plant the trees ten feet apart each way. We have grown them sufficiently to establish the fact that ours is a good section of country for raising quinces.

Grape Growing.

To the Chairman.—Grapes have not been much cultivated until recently; but of late some of our people have been planting quite extensively. On the mainland the Concord, the Delaware, the Hartford Prolific, and the Clinton have proved hardy. The Hartford we now deem almost unworthy of cultivation, but the Concord and Delaware are good for market, and the Clinton is a profitable wine grape. Our standard grape is the Concord. It and the Delaware both prefer a light sandy loam, with a porous subsoil or gravel. The Catawba I think would do better on heavier soil. There has been a good demand for grapes, at from three to five cents per pound, Delawares in large quantities bringing five cents, and Concords three cents. We consider these profitable prices. We never had a frost to injure the grapes within my recollection except three years ago, when we had one in June; and even that frost did not injure those which were close to the lake. There is no disease which injures the vines or leaves. The rose bug this year has injured us a little. It is its first appearance in our district, and I have not even seen them on the rose bush until this year. The birds do not bother us much. I have never seen them eating any fruit.

To the Hon. Mr. Wood.—When I speak of getting three to five cents per lb. I mean that is what we realized. Grapes which we have shipped to St. Thomas and London brought six cents per lb. in those places, and after paying expenses we got from three to five cents per lb. We have robins in our section of the country. I never saw them eating grapes, and I don't think that they will eat any fruit that is concealed by foliage as the grape is. We have only a very few cedar birds—perhaps one or two in the season.

To. Mr. Dymond.—We have a great many birds, but we don't regard any of them as enemies, except the blackbird and the crow. The failure of those people who gave up grape culture was just owing to their ignorance of the proper method of cultivating the fruit. I don't think that increased drainage has materially affected the grape crop on Pelee Island. They are going into the culture of the grape there on a large scale. They grow the Catawaba, the Concord, the Isabella and the Delaware. The Catawba is their principal grape, and it ripens very well, but it does not ripen with any certainty on the mainland. Pelee Island is in Lake Erie; it is nine miles long, by five in width. Some people are going extensively there into fruit growing. Those from whom they acquired the land had been engaged in general farming.

[*Mr. Cady.*]

Wine Making.

To the Hon. Mr. Wood.—We have a few people who are going into wine manufacture. Mr. Smith, of Pelee Island, made 8,000 gallons last year; and about 15,000 gallons were made in the district last year altogether. Mr. Smith was awarded the gold medal at the Paris Exhibition. The Catawba is mostly used for wine on the island, and the Clinton on the mainland.

To Mr. Dymond.—The average yield of the Concord grape is about four tons per acre, though we sometimes realize more. At three cents per lb. that would be $240 per acre.

Strawberries—Raspberries—Plums.

Some few people have gone into strawberry growing to the extent of one acre perhaps, and raspberries, etc., to the extent of three to four acres. The culture of these plants has been satisfactory, and a few have been shipped, but generally they are peddled through the country. Gooseberries are not grown to any extent, and cranberries are not grown at all. Plums are a very fine crop with those who have trees planted. Mr. Alanson Elliott, of Colchester, brought to Kingsville a limb of the Lombard variety twelve inches long, which contained fifty-two fully developed specimens. He says it was not an exceptionally well-laden limb, as all of his trees were alike. Grapes are a splendid crop. Mr. Michael W. Wigle, of Kingsville, gave us some very fine specimens of the Champion variety, which were fully developed 12th August. Peach trees are breaking down, so great is their load of fruit.

EDWIN CADY.

MR. JAMES DOUGALL'S EVIDENCE.

James Dougall, of Windsor, was called and examined.

Fruit in the Windsor District.

To Mr. Dymond.—I have lived in the neighbourhood of Windsor since 1830. Latterly I gave up the mercantile business, in which I was engaged, and became a nurseryman. I have been conducting my nursery for the last twenty-eight years, and my experience is largely that of a fruit tree grower, though I have planted specimen trees of every variety. I was one of the first members of the Fruit Growers' Association, and have had a great deal of experience in fruit growing. I think Essex is a very favourable fruit growing region, though it was formerly much more so than now. Whether the change is owing to climatic causes or not I cannot say. I should think that the most favourable part of the county for fruit growing would be the township of Anderson, along the lake shore and along the Detroit River. I would follow the course of the river and lake in selecting the fruit-growing district of the county. That region is adapted to the growth of every kind of fruit that can be grown in the temperate zone. We have been more subject to insect pests of late than we were formerly, and we have also had the apple and pear blight. The younger trees are not touched by the blight, but the older ones are. We principally grow very early summer or winter apples, though we have some late summer and fall apples. Every other year we have an abundant crop of peaches, and as soon as they come in fall apples cannot be sold at all.

Varieties of Apples.

Of the early summer apples I would recommend the Red Astrachan, the Early Harvest and the Tetofsky. They bring about 50 cents a bushel, or about $1.50 per barrel, including the barrel. Our winter apples are the chief varieties for market. The favourites are the Baldwin, the Canada Red, the Golden Russet, the Northern Spy, the Rhode Island Greening, and the Jonathan, which is allied to

the Spitzenberg, and is a great bearer. Of the fall apples the varieties preferred are the Duchess of Oldenburg, the Gravenstein, and the Maiden's Blush. For dessert apples I would advise the growing of the Canada Red, the Northern Spy, the Jonathan, and the Blenheim Orange. These varieties all carry well. For cooking purposes the Greening is as profitable as any, and the Blenheim Orange is also a favourite. We ship a good many apples to Detroit, which we call a local market. The foreign shipping trade has not been much developed.

Shipping Apples—Wintering Apples.

Some Chicago firms have come down and purchased apples in the orchards, gathering and barrelling them, and taking them away. I do not know what prices they pay. Winter apples are worth on the average about $2 per barrel, but buyers will not give so much as that for apples on the tree. Some apples have been sent to Montreal, but whether they were afterwards sent to Europe or not I do not know. No effort has been made towards packing for exportation, as it is difficult to get freights at the proper time. The propellers are all full of grain and are not willing to stop and take on fruit. Montreal would be our outport for shipping to Europe. I don't think we could ship them by rail to New York for Europe, as the distance by rail is too great. The proper method is to lay down a layer on what is to be the top of the barrel, the blossom end being downwards; other layers are packed in above these until the barrel is a little more than full, and then they should be pressed down slightly. I agree with Mr. Cady's evidence as to the proper method of keeping apples in the winter. They might be kept in a cool, dry cellar, but it would not do to have any roots or vegetables in the same cellar. They are best when they are just kept from freezing and no more.

To the Chairman.—I would not approve of letting the barrels of apples lie in the orchards, as our fall weather is sometimes too hot for them and would ripen them too quickly. The proper way would be to take them from the orchard and put them in an open shed facing to the north.

Increase of Apple Cultivation—The Blight.

To Mr. Dymond.—There is a tendency to increase the area under cultivation in spite of the discouraging experiences of late years. The blight I speak of kills the trees in a few years, but sometimes the younger ones will recover and grow again. We had no experience of the blight until about eight years ago. It commenced with the quince trees, then it went to the pear trees, and then it attacked the apples. I have no theory as to its cause. It is almost as serious one season as another, though perhaps dry seasons are a little the worst. Nothing can be done to prevent it by the treatment of the trees in the winter. The hardier trees are more subject to it than others, and the crab apple trees most of all. The Russian apples are very much subject to it, though there are some varieties, such as the White Astrachan, that appear to escape it. Cider-making is not carried on to any extent with us.

Local Seedlings.

There are a large number of seedling apples among the French orchards, and the people of Detroit come over and buy them for the purpose of making cider, but it is not a local industry. Apple growing is not considered a distinct industry, but is carried on by farmers. I think that the farmers are beginning to cultivate apples intelligently, but we were very much behind for some time.

The Codlin Moth—Birds.

We are terribly troubled with the Codlin moth. The only way to get rid of them is to pick the fruit as soon as it falls, and then put bands of cloth, paper, or straw, around the stem of

the tree where the larvæ would conceal themselves while they change into the chrysalis form. The bands should be examined often and the worm destroyed. Still that plan does not rid us of them effectually. I have cattle in my orchard, but they do not seem to make much difference, as the worms are too quick for them. You may pick up the apples, and in nine-tenths of them you will find no worms, as they have escaped. I don't think we have any birds or other natural enemies to the moth. Some birds, such as the woodpecker, eat them in the chrysalis state, but we have not many woodpeckers. We have a good many birds, but none of them are destructive to the apple. The Baltimore oriole and the robin are the most injurious to fruit, especially the former, the latter only consumes cherries and small fruits. We have one local apple which is the best late summer cooking apple that I know of. It is a large, beautiful apple, rather acid. It was found on the farm of a gentleman named Goyeau.

Best Winter Apples.

To the Chairman.—I think perhaps that the Jonathan would be the best winter apple for a person to plant for marketable fruit. The Red Canada is a fine apple, but it is slow in growing. The Northern Spy is very long in coming into bearing except in a warm, gravelly soil. When it does come in it is a very good bearing apple, although it is apt to have a great many small, worthless apples on the tree. I think that a gravelly soil with a porous subsoil is the best for the apple, and orchards should be well drained. There is very little land that is naturally well drained, unless it is gravelly soil with a porous subsoil.

Pear Culture—Blight.

To Mr. Dymond.—The only pears that will sell well with us are the early summer, and the late autumn, and early winter, owing to the peach crop coming in between these two periods. There are some very old French pear trees in Sandwich township which bear enormous crops, for which they get $1 a bushel. The fruit has to be shaken off the trees. These trees are not subject to blight, and often yield from twenty-five to thirty bushels each. They could be propagated by suckers (as they all have suckers), but not by grafting. I have tried to propagate them by grafting on the seedling stock, but they never come to anything in that way. By propagating them we would get the same tree with the same characteristics, but they are not propagated to any extent. I have not had any demand for them. I am not able to give you any cause for the blight attacking the trees. Sometimes one tree is affected and sometimes another, and sometimes a tree that is attacked this year will escape the next. I used to think that some varieties were proof against it, but after a few years they were attacked. The leaves and the young shoots get black, and they should be cut off about a foot below the diseased part. When you come into an orchard in the early morning where the trees are suffering from blight, the smell is something like the smell of a field of diseased potatoes. I wrote to Charles Downing, the great pomologist, and he said the blight came periodically—once in twelve or fifteen years—but he could not account for it. The best varieties, given in succession as they ripen, are the Eliot's Early, a new pear raised here, Doyenne d'Eté, Beurre Giffard, Supreme de Quimper, Clapp's Favourite, Belle Lucrative, Flemish Beauty, Seckel, Louise Bonne de Jersey, Duchess d'Angouleme, Onondaga, Doyenne de Comice, Beurre d'Anjou, Graslin, and the Beurre Clairgeau. The three varieties last named are the most profitable pears that I know of, and the Beurre Clairgeau is a large and very handsome pear, which will keep till Christmas. Some kinds that are profitable in our locality might not be so profitable in other places, whilst others that do not suit here, like the Flemish Beauty, are excellent elsewhere. The Flemish Beauty is a very hardy pear, but it is worthless with us as a profitable fruit, because it ripens too early, but I believe in the neighbourhood of London, Toronto, and Hamilton, it does well. The Seckel is one of the varieties most free from blight.

Effects of Frost.

The winters of 1855 and 1857 were very severe, and those years I lost 10,000 pear trees, and as many plum trees. They were young, but very fine trees in the nursery. They leafed out, blossomed, and the fruit formed about half its size, and then the trees withered and died, and we found upon examination that they were killed just at the snow line. Our coldest weather the previous winter was made up of light sunny days and severe frosty nights. The sun melted the snow round the stem in the day time; it froze up at night, and the trees were killed in that way. Had anything such as felting paper been put round the stems to keep the sun off the bark when frozen, they would have been safe.

To the Chairman.—Apple and pear trees are very easily protected from severe frost by using felting paper. It is the cold winters that make the trees black-hearted.

Belts of Evergreens.

To Mr. Dymond.—I advise the planting of a belt of evergeens for the protection of orchards. Deciduous trees do not protect them very well in the winter, because of the absence of leaves. I think a row of trees would be very little use. I would have a belt of young trees of some width, and they should be planted on the sides from which the coldest winds come. As the country gets cleared up trees are needed more and more every year. In Lower Canada they used to raise apples and pears well before the country was cleared off, but they have left wide strips of trees in such a shape along concession lines that the wind sweeps through between them as it would through a large funnel. If I were going into orchard planting I would plant a belt of trees the first thing on all sides except, perhaps, the south-east and south-west. I think that is indispensable unless in parts of the country were there are plenty of woods.

Plum Culture.

I have a large number of plum trees and have a good crop every year. I would cultivate the white Magnum Bonum or yellow Egg. The Bradshaw is a tender tree, and the Washington is also rather tender. Oullin's Golden Gage is a fine plum, but rather tender. The Jefferson is one of the best. The Prince Engelbert and Guthrie's Apricot are both excellent plums. People will not buy the English Green Gage just now, as it is too small; they want the large plums. The Brandy Gage is one of the hardiest plums, and bears enormously. The Lombard is, without exception, the most profitable plum we have.

Protection from the Curculio.

The curculio is easily avoided by keeping plenty of hens and chickens. My plum trees are loaded down with fruit, and there is not the sting of a curculio to be seen, while just outside of my orchard nearly every plum has been stung. I planted my trees about ten feet apart, and I have good fences, so that the fowls cannot get through. There should be enough fowls to keep down the grass and weeds, otherwise the circulios would escape. In my plum orchard there is no grass or weeds at all; in fact, I have to cut grass for my fowls, and I have more plums on my trees than they can bear without support. Shaking the trees is a very good plan, but I gave it up after a number of years' experience. My man had shaken the trees every morning for three weeks, and then there came three days of constant rainy weather, after which the fruit was all stung with curculio. I find that keeping fowls is a perfect protection against the insect. I have a few plum trees in my nursery, but I cannot get a plum off them, because there are no fowls there. In our part of the country we can always get a high price for spring chickens in the Detroit market. If you have only a few plum trees in your garden, and do not want the chickens to run at large, you could put a coop of young chickens under the trees, and they will devour the insects.

[*Mr. Dougall.*]

The Best Soil for Plums.

The most suitable soil for plum culture is a heavy clay loam. The trees are not so healthy when planted in sand, as they are liable to attacks of black knot and the curculio. The best plan of avoiding insect pests is to keep the trees healthy, as you will always find that the sickly trees are attacked the first. We can sell all the plums we can raise in our part of the country, at from $2 to $4 per bushel: $2 for the small ones and $4 for the large ones. The Lombard plum sells at from $2.50 to $3. Plum-growing is profitable if people only attend to it. I think the whole of this western peninsula would be favourable to plum-growing, except the loose sandy soils.

Seedling Plums.

I have raised some very fine seedling plums, and I have one which I think is the handsomest plum we have. It is a large plum, nearly as large as the Magnum Bonum, yellow, with a pale carmine cheek that just comes on when it ripens. Like the peach, it bears on the young wood of the previous year. It is not well known, and I have not disposed of any trees. I have several other fine seedlings, one of which is as large as the Washington and richer than the Green Gage. I have been experimenting a great deal on raising new varieties. We have the Wild Goose plum, of which there are two kinds: one purple and the other red. The purple is worthless, but the red is a very nice fruit. The fruit falls from the trees at once, when ripe, if touched with the finger. It is a delicious fruit and very hardy. The only one I have that is bearing is in my kitchen yard, where the fowls can get at the fruit, so I do not know whether it is liable to the curculio or not. I suppose it would be as liable as other varieties. The earliest plum is the Royal Hative.

Peach Growing.

Of peaches the Early Louise is a favourite, but is later than the Alexander, which is partially a clean stone peach. The Alexander is the most profitable peach, on account of its beauty and earliness, because we can always get the highest price for it. The Alexander will bear well on trees three years planted, but by planting them in the fall they will gain a year. I suppose there would be about one-half a bushel on each tree the first year they bear. $4 to $6 a bushel can easily be got for them. The most profitable peaches are the Alexander and Crawford's Early. Our peach trees are not troubled with insects, and we have not had any sign of the yellows. In the second year of bearing the Alexander peach tree would probably bear one bushel, and the maximum in full bearing would be three or four bushels. The trees should be propped up when they are bearing—peach trees more than other trees, because they are so tender. In our county one aspect is as good as another for an orchard. What we require is a well protected situation near the river or lake. Peach culture is increasing in the district, especially along the lake shore. The curculio attacks our peaches, especially when there is a poor crop.

Apricots and Nectarines.

We do not grow apricots and nectarines, because they are so liable to the curculio, but they could be protected the same way as our plum trees are: by chickens. The common way of jarring the trees would not do with the apricot, because the whole of the fruit would come down. The curculio is very bad on the wild plums, and also on the cherry and hawthorn. Cherries do well with us, including all the Hearts and Bigarreaus. I should think that the Early Richmond, which is a Morello, is one of the most profitable varieties.

[*Mr. Dougall.*]

The Birds.

The birds do not attack our cherries very much, or rather when we have a good crop of cherries we have enough for ourselves and the birds as well. The robin, the cat bird, and the cherry bird are the most troublesome. The Baltimore oriole is also very destructive, and the scarlet tanagar is sometimes bad, as they bring their young to the trees in large numbers. I don't see that there is much use in protecting the cherry birds, but the robin eats almost all kinds of insects found on the ground. I could not tell what kind of insects they are, but I think he picks up a great many grubs. The insects that prey upon fruit he would not be likely to pick from the ground. I have seen the robin eating worms and moths, but what kinds I could not tell. But I should think that he would be useful except during the cherry season. I have no doubt that he eats enough insects to compensate for the fruit he destroys. I have never seen the robin eating grapes. On the whole, I should not desire to see any change in the relations of the State to the robin.

To the Chairman.—I do not know of any bird that attacks the tent caterpillar after it becomes hairy, though some birds may eat it when it is very young. I destroy its nests regularly, so that it is not allowed to propagate its young. In our part of the country its numbers have been very much reduced of late. Our tent caterpillar is not the same as the Lower Canadian caterpillar, which is rather migratory.

Cherries—Strawberries—Grapes.

Among the most profitable cherries are the Early Richmond and the Black Tartarian, but I think the most profitable of all is a seedling which I raised myself. It is called the Windsor, and is an enormous bearer. Ellwanzer & Barry, of Rochester, offered a large sum for the right of propagating it, but I would not accept it. It is one of the Bigarreau family. The tree is now in a position to distribute. I have another cherry, also a Bigarreau—a weeping cherry, which I call the Weeping Napoleon. The original tree has been cut down. It is so much of a weeping tree that if it is budded low it will not grow up to be a tree. I have not sold any of the Windsor cherry trees, but I sent trees to all the leading horticulturists, and it is too early to receive reports from them. You could not depend upon getting the same kind of fruit by planting the pips. Strawberries are not very largely cultivated in our part of the country for market, because we have no market except at a great distance. If we were to cultivate the London market we might send them there. We could supply the Toronto market two weeks before the Oakville people, but that would be a considerable distance to send them. To take them to Detroit we would have to pay a duty, and we would come into competition with the Michigan growers, whose fruit is as early as ours. The Wilson strawberry has been principally cultivated hitherto, but I think it is running out. It has also become so mixed by the fruit seeding that it is almost impossible to get the true Wilson strawberry anywhere. The Col. Cheney is a very profitable strawberry with us. The Shapeless Seedling is also a very fine strawberry —one of the finest. The Crescent Seedling is more profitable than the Wilson. The only objection to it is that it propagates too fast—it has too many runners. We do not grow very many raspberries. We have no wild ones in our part of the country. The only white currant which we cultivate is the White Grape, a large fruit about the same size as the Cherry currant. It is easily cultivated. The Cheney or Versaillaise currant is a large red fruit, and the Long Bunch Red is nearly as large as the Cherry and more prolific. Red currants are preferable to the white, because the people do not know how to put them up in jelly. The white currant makes a jelly of a colour that is too light, but if they would mix the white with the red they would get a jelly that is much finer in appearance than the red alone. Black currants are not profitable here. We grow gooseberries, and they are not subject to mildew. The principal varieties are the Houghton and the Downing. I think the White Smith is pretty generally free from mildew with us. We have some seedlings which are crosses between the Houghton and the English gooseberries.

[*Mr. Dougall.*]

They have a very fine berry, and are not subject to mildew. In the neighbourhood of Amherstburgh there are a great many wild prickly gooseberries, and I succeeded in getting a cross between them and some of the English varieties. It was not prickly, but was covered with hairs or spines. The produce of it bids fair to be very fine and suitable to the climate.

To the Chairman.—I do not know that the people on the Michigan side of the river have any advantage over those on the Canadian side in growing any of the fruits I have mentioned. The soil of Michigan is different from ours. Near the city of Detroit the soil is sandy, while we have a heavy clay loam, which is, perhaps, more favourable than theirs in enabling the fruit trees to stand the winter. The two varieties of grape which I prefer are the Concord and the Champion—or rather the Talman, for that is the correct name. The Concord is the king of grapes for profit. I agree generally with the evidence given by Mr. Girardot. Rogers' Seedlings are worthless with us, as they are subject to a blight of the leaves when the fruit is ripening.

JAMES DOUGALL.

MR. MACKENZIE ROSS'S EVIDENCE.

Sittings at Chatham continued. July 24th, 1880. *Present*—Messrs. F. Malcolm, (Chairman), and A. H. Dymond.

W. Mackenzie Ross, of Harwich, was called and examined.

Fruit Culture in Kent.

To Mr. Dymond.—I have been connected with fruit culture for some time in this neighbourhood, and I am both an orchardist and a nurseryman. I have 2,000 pear trees for marketing purposes, and I raise a good many trees for sale. I have 2,000 trees just coming into bearing; I have 6,000 trees altogether, consisting of the leading varieties. I have between 3,000 and 4,000 apple trees, 2,000 pear trees, and the rest are plums, peaches and cherries. I also cultivate the fig tree, peanuts, and Sweet Potatoes. I have a large crop of sweet potatoes this year. I have planted four varieties of potatoes, for which I paid $10 per bushel. They are called the Alpha, Trophy, Ruby, and Bromwell's Superior, and mature in 60 days. The Early Rose requires 90 days. They come to the surface more than the Early Rose, and we are trying to see if we cannot get a second crop. I have 45 different varieties of potatoes, and have tried a great many new varieties.

Apples—Choice of Varieties.

Of apples I prefer for my own fancy both for cooking and dessert, the Northern Spy, but the great favourite in this part of the country is the Baldwin; the skin is coarse and thick, but the apple keeps well. For home consumption or exportation I would recommend the Northern Spy; the Seek No Further is also a very delicious apple. There are several varieties of it. We have another called the Bachelor, or King of Apples; it is a small apple, but very delicious. Another favourite with some people is the Red Astrachan, but I would not recommend it, because it is a poor bearer. The Duchess of Oldenburg is a good apple.

How to Plant the Trees—Drainage.

I plant the trees 30 feet apart each way. Apples can be grown on every kind of soil which we have in this part of the country. The land should be well drained. Some of my trees are in full bearing, others are young.

[*Mr. McK. Ross.*]

Market for Apples.

We find a market for our apples in Chatham, but our summer apples are mostly consumed at home. I think Europe will be our market for apples in future, though I have not sent any there. The Golden Russet and the Swayzie Pomme Grise are fine apples, and I think they will be suitable for the English market. The latter is a little larger than the Golden Russet, and has a little darker colour, but it is a beautiful, well shaped apple of first quality. We can raise the Golden Russet here in any quantity. I am going into Russets more than any other apple, because if we cannot sell them in the fall we can keep them over.

Cellar Arrangements.

I have a cellar with shelves all round, upon which I put the apples two or three deep. I prefer this plan, because in going round I can always discover the fruit that is decaying, and this is important especially with very choice apples. The temperature should be kept just at the freezing point. I have one apple called the Phœnix which will stand a great deal of frost. I had it covered with frost without injury. Apples should not be kept in the same cellar with roots and vegetables, because if it is warm enough for the vegetables it is too warm for the apples. I have about 18 acres of land just outside of the corporation; it is pretty much all planted in fruit trees. I don't think it is desirable to exclude light in keeping apples.

Packing Apples.

We send our apples to Montreal and not to the United States. In packing for a distant market I would adopt the same plan as that described by Mr. Dougall. The great trouble with us here is, we do not select or pack our apples properly. I think if a man had a good saleable article, and was to pack the fruit properly and put his name on each package, he would soon be able to get up his name, and get good prices. It might pay to have very choice apples put up in tissue paper. The Æsopus Spitzenberg does not succeed very well with us.

Pear Varieties—Blight.

I have eighty-five different varieties of dwarf and standard pears, and I have been adding new varieties for several years. They are not seedlings. The only drawback to pear cultivation in this part of the country is the blight, and we can find no remedy for it. I have not brought my pears into such cultivation as to be able to sell many of them, but I will be able to supply the home market until the 1st of February with varieties coming in season. I have not done anything towards finding an export market. The Flemish Beauty is a magnificent pear, but for export the Vicar of Winkfield would be the best. It is a large, showy pear, maturing about Christmas, and it will keep for two or three months. We do not expect to send our pears to as great a distance as England. The blight attacks the same trees every year, but this year I have none on the pears, though there is some on the quinces. It generally attacks the trees in the beginning of July, and if they escape at that period they do not as a rule suffer from it at all. According to Mr. Downing—"Fruit and Fruit Trees of America"—this blight appeared in the country a hundred years ago. We have always been troubled with insects until this year. We had a very mild winter, though I cannot of course say that our exemption was due to that. The Rhode Island Greenings are more or less affected by the winter. The peaches trouble is with the curculio and the borer. I got rid of the curculio last year by jarring the trees. I used to be troubled with the codlin moth, but every day or two I used to gather the apples on the ground and feed them to the pigs, and I have not been much troubled with them since. I have not tried to get rid of the

[*Mr. McK. Ross.*]

curculio by putting poultry in the orchard. I used to jar one hundred trees in a quarter of an hour, and kept on until we had the number of curculios reduced very small. We kept count of them this spring and caught 1,500 of them in twelve days. The borers are particularly troublesome to the peach trees in this neighbourhood, but the tent caterpillar is not very troublesome. I prefer the Early Crawford peach, but that variety does not bear very heavy crops. We grow cherries largely. I think the Early Duke is the best for early marketing purposes.

Destructive Birds.

We did not get any this year owing to the depredations of the robin, which I am sorry to say is protected by statute. The woodpecker also gives us trouble, but I do not know the cherry bird at all. The blackbird destroys a good many cherries and also devours some corn. I do not think that the robin eats any considerable number of insects during the fruit season. I think the robin has four broods in the year, and the young are as lively in going for the fruit as the old. I never saw robins eating insects, though I have seen them carrying the common earth worm after rain. I don't think they eat caterpillars. The robin is very destructive to some varieties of pears, and he is very fond of strawberries. The woodpecker feeds on larvæ, but I think he does harm by the holes he picks in the bark. I think the fruit trees we get from the United States are as good as any, but people are liable to be imposed upon by agents.

Grape Growing.

I am growing grapes to the extent of about 200 plants. I grow them for the table. I have all of Rogers' Hybrids, and I think his No. 4 and 19 are magnificent grapes. The Concord is a nice grape for wine and table purposes. I am growing the Souvenir de Congress pear, which, according to Mr. Arnold, of Paris, cannot be raised in his locality. All the varieties of fruits which we have stand the winter well. I prune my grape vines in the fall, and in the beginning of April I take them in an inch or two. If I find any dead shoots I take them off. I don't lay the vines down in the winter.

Pears, Apples and Grapes.

The Clapp's Favourite pear is a very fine fruit, and the tree grows very quickly; they sell well here at from $2 to $3 per bushel. No garden should be without Doyenne d'Ete, Beurre Giffard, Bartlett, Clapp's Favourite, Flemish Beauty, Belle Lucrative, and for large pears, Duchess d'Angouleme, and Souvenir de Congress. For apples, a few summer, such as Early Harvest, Tetofsky, Duchess of Oldenburg, Gravenstein, St. Lawrence, Sherwood's Favourite, and Keswick Codlin. For winter apples, the Baldwin, Roxbury, and Golden Russets, are very good; Grime's Golden Pippin is a charming little apple; Lady Apple, a picture of beauty; Northern Spy, Greening; Ribstone Pippin, a lovely apple, it is in season here in the fall; Spitzenberg Æsopus cannot be surpassed for eating quality, and the Fameuse or Snow Apple is an apple that should be in every collection along with many other good apples, that time and space will not allow me to mention here. While at the Provincial Fair in Hamilton I saw and tasted a white grape called the Niagara, the very best in my opinion of the seedlings now before the public. It will not be for sale until the spring of 1882; I made arrangements to get some of them here by that time. I have all the Rogers' grapes; they do well here, but Nos. 19, 53, 4, 15, and 1, were very fine with me this year, and I would like to recommend them to others; they require no protection in this latitude.

Soil and Climate of Kent.

The soil and temperature of the county of Kent cannot be surpassed for fruit growing or for farm purposes.

WILLIAM MACKENZIE ROSS.

[*Mr McK. Ross.*]

Sittings to take oral evidence held at Toronto, October 4, 1880. *Present*—Messrs. W. SAUNDERS (Chairman), and A. H. DYMOND.

MR. A. H. PETTIT'S EVIDENCE.

PEACH GROWING—A FRUIT COMPANY.

Mr. A. H. PETTIT, of Grimsby, was called and examined.

I grow a considerable quantity of peaches. I have some ten acres of peaches, apples, pears and plums, and probably as many more not in bearing yet. We have lately organised a Stock Company for the sale of our fruits, composed of the largest growers in the district, and have agencies opened in Toronto and Montreal. I have found the peach industry a profitable one. This has been an unfavourable season in some respects; extreme heat at intervals caused them to ripen prematurely, which, together with an abundant crop, gave us very low prices.

A FRUIT GROWERS' ASSOCIATION.

We have a Fruit Growers' Association in Grimsby, of which I have had the honour of being President during the past two years. Our Association has in view the advancement of the culture of fruit, selecting new varieties and testing their merits, discussing the best methods of cultivation, planting, pruning, and marketing our fruits.

PROFITABLE VARIETIES OF PEACHES.

The kinds of peaches that are the best and most profitable would include a large list. The following varieties ripen in the order named: Alexander, Early Canada, Beatrice, Hale's Early Crawford, Old Mixom, Late Crawford, Smock. These varieties I find the most profitable to grow. A peach grower would require all these varieties to fill up the season. The early and late varieties this season have been the most profitable, and on the average I think are always the most profitable. I don't know that Early and Late Crawfords are more prolific than others; I consider them better for canning. Three years out of four we will have extreme heat during their time of ripening; they will be rushed on the markets and sold at low prices, while the very early and late varieties, although not so good in quality, will bring better prices. In point of quality I consider the Crawfords quite superior to the others.

A CANNING FACTORY.

We have a canning factory operating, which disposes of a quantity of fruit. It is not on a very large scale, but preparations are being made to go into canning extensively. The factory is owned and carried on by Mr. B. R. Nelles. I suppose the factory will put up about 150 bushels a day. They have been kept busy all the past season. I should think there would be no difficulty in finding a market for the canned fruit. I could not say if there is a market in Europe for fruits canned on this side.

THE MARKET FOR PEACHES.

We dispose of our surplus peaches to all points; we can carry them, in three or four days to Halifax and to all places north of us. I have made some eight or nine shipments to Halifax by express this year. Montreal, Toronto, Guelph, Hamilton, and London, are our principal markets.

[*Mr. Pettit.*]

Large Shipments.

As near as I can make out, about 70,000 baskets have been shipped from our station. These were grown within an area of two miles east, south, and west of the station, the lake being on the other side.

The Soil.

Peaches are grown in separated localities, small districts of clay and sandy soil being interspersed. Between the sandy soil you will find strips of clay which are not so well adapted for their growth. If, however, this clay soil is well under-drained, it would grow peaches very well.

The Yellows.

Some of our trees have suffered to a considerable extent from the yellows. This disease first appears in the fruit, which becomes a bright red colour on the outside and reddens through to the pit, and ripens two weeks earlier than its usual period. A portion of the tree only will ripen, while the other will not. The fruit itself is insipid, flat, and not pleasant, although of a bright or spotted appearance on the outside. There is no appearance of disease in the foliage until the latter part of the season or the year following. I don't think you will find any tree recover after it has once been attacked with the disease. The first appearance of the disease is seen in the fruit. I attribute the spreading of it to insects and bees. We have dug around the roots of some trees and they were apparently very healthy. I have not known any injury to result from people eating the diseased fruit. In the localities where the fruit is grown it is not generally eaten. The only remedy I can recommend, and which I have carried out to a certain extent, is to chop the diseased trees down and burn them up at once, fruit and all. I regard the disease as infectious. It has become very much more prevalent of late years. Three years ago was the first we saw of it. I think it was brought to our locality by trees purchased from the other side. We have been cultivating peaches largely about twenty years, but we have grown peaches more or less ever since I can remember. There are no means of detecting whether the tree is infected with the disease when sent from the nursery. It does not manifest itself the first year either in the wood or roots. The next year after the disease has made its appearance, or the second year, there appears a discoloration. I have only had two trees affected on my place, and these I removed at once.

Market Prices for Peaches.

The average price of peaches in my district was from 30 to 50 cents a basket this year; a basket containing twelve quarts. This is a fair paying price, although very low compared with former years, when the profits were large.

Renewal of Peach Orchards.

To Mr. Dymond.—A peach orchard requires renewing every fifteen years. Our plan is to be continually taking out old trees and replacing them with new ones.

Prevention and Detection of Yellows.

I think if the sale of diseased peaches were prohibited it would in a great measure assist in preventing the spread of the disease. The fruit, ripening as it does two weeks earlier than its proper time, brings a better price on the market, and hence there is no inducement to growers to cut down the trees. If the sale of the fruit were prohibited the diseased trees would necessarily be chopped down. I think an ordinary fruiterer is capable of detecting the yellows in peaches. A person not accustomed to the culture of fruit would not detect the disease. I think the redness I speak of is an indication of the

disease; by proper inspection there would be no difficulty in saying which were bad. When I was on the wharf here one day this summer I noticed that about two-thirds of the fruit exposed for sale was diseased. I should think these peaches were unwholesome. I should not care to eat them myself.

The Curculio.

To the Chairman.—I think only the early varieties of peaches suffer from the curculio; we have not noticed it in any except in the very early varieties. We have the borer in our section, and it is very troublesome, attacking all varieties alike. I have not adopted any protective measures excepting to dig them out and destroy them. I have never taken any regular season of the year for doing it, but do it just as we get the time in early spring or later on. They are easily detected, gum oozing from the bark being an indication of their presence. Two or three are sometimes found in the same tree. If steps are not taken to destroy them each season the tree becomes girdled. We have no other insects in the trees.

Orchard Management.

Sandy soil is the best for peaches. Eighteen feet apart each way is the proper distance for planting peach trees, in an orchard where there are peaches only. I have done very little pruning, and cut out only the dead wood. I allow the trees to branch out very near the ground, and consider thinning the fruit preferable to so much trimming. The fruit is equally good without trimming. I would cultivate the soil about the trees. A paying crop should be expected after five years' planting; you would have some peaches before that time, but not a paying crop.

Seedling Varieties.

We have several new seedling varieties of peaches, but none to recommend over other peaches. Some of them compare favourably with the varieties before mentioned. No names have been as yet attached to these new varieties. There is one of these seedlings called Late Red Crawford, being a seedling of the Late Crawford. It has a yellow flesh, and is a late variety.

Apricots—Grapes.

I do not grow apricots to any extent; the curculio destroys them. I have an acre or an acre and a half of grapes.

Apples—Winter Varieties.

In apples I found it best to grow very few varieties. For winter use I have four kinds, Baldwin, Greenings, Russet, and Northern Spy. I think these are really the most profitable varieties, unless you go into summer varieties.

Summer Apples.

I think a few early apples can be profitably grown; that is, such as the Red Astrachan and Early Harvest. The market in summer apples, however, may easily become overstocked.

Markets for Winter Apples.

The opening of new markets will give us better facilities for growing winter apples. There are markets to be opened yet for the sale of our apples. The North-West Territories might receive a large portion of our crop, and I think they will. I don't think the

English market is yet fully supplied. We are shipping apples to Europe, sending principally King of Tomkins County, Cranberry Pippins, Twenty-Ounce, and a few Greenings. We have made arrangements with houses in London and Liverpool to sell for us on commission. We are selecting our apples very carefully, and sending them perfectly sound. Those I have just mentioned, being early winter apples, we wish to dispose of first. The Cranberry Pippin is a good cooking apple and crops very well. I don't think it is suitable as a dessert apple. The King of Tomkins County brings about as good a price as any apple we ship. Some seasons it is subject to sunburn or watercore.

Prices—Packing—Shipping.

Prices in England range from 16 to 20 shillings—say $4 to $5— a barrel. It costs to ship them from Grimsby to London $1.28 per barrel. They are packed in barrels and shaken down well. If well shaken down they will require very little pressing. I think that pressing too hard does more harm than good. Shake well and press lightly. I don't approve of putting anything with them to fill up the interspaces of the barrel.

Grape Culture.

Of grapes, I cultivate the Concord, Diana, and Delaware. I find the Concord is the most profitable. I think almost any soil will grow good grapes if it is properly cultivated and drained. I am growing grapes on clay subsoil, with a mixture of sand and clay on the surface. I under-drained thoroughly before I commenced, and I have a spendid crop of grapes this year. My acre was planted two years ago last spring, being yearling vines when planted. This year I had over five hundred baskets, twenty pounds to a basket. I should say that twelve tons would be an enormous crop from one and a half acres, the vines being of seven years' growth. My vines are planted eight feet apart each way. In some instances grapes have been a failure this year. A person living two miles from me has not had a crop this year, although in former years he has had great quantities. From 3½ to 5 cents would be the average price for grapes in our section. My grapes have never suffered through frost, insect enemies, or birds. Tomatoes, corn, peas, and cherries are canned in the factory above-mentioned. I don't think strawberries are canned. I could not say if the cherries are stoned before they are canned.

Quinces.

I have not grown quinces myself, but they are grown successfully in my district. The Orange variety is grown successfully. I am not very well acquainted with the other varieties of quinces. The Orange is considered the best variety with us. I think they are only $1 or $1.50 a bushel this year.

Strawberry Culture.

I cultivate plums, strawberries, and currants. Of strawberries for market, I prefer the Wilson. I have tried the New Dominion, Sharpless, and some others, but I find the Wilson the best market berry. I am not acquainted with the Captain Jack nor the Crescent. I should say 2,000 quarts per acre would be a fair yield per acre for strawberries. The average price would probably range from 4 to 7 cents, the higher price being for the earlier portion of the crop. After two years' picking I plough the vines up. If the ground is not good it would be better to plough at the end of the first year. It would be less trouble to replant than to clean the old. I would not advocate taking off more than two crops, and in some cases only one. I have grown very few blackberries and gooseberries.

Strawberry Planting and Cultivation.

The cost of plants and planting an acre of strawberries would be about $85. Mine are planted three and a half feet apart, and twenty inches in the row. I think you

could get plants for $1 a thousand. To set them out would cost about $8 a thousand, and it would take 9,000 plants for an acre. One man could cultivate about three acres properly, that is, if he devoted his whole time to it, from spring to the time of ripening. For the first year you would have to cultivate them till September. After ripening they are cultivated for the next year.

Grape Wine.

With regard to grapes, I put them up on three wires. The highest wire is about five feet high, and the lowest fifteen inches. There is considerable wine made in our district, but the grapes mostly sell for dessert. The only varieties I have tried for wine are the Catawba, Isabella, and Concord. The Catawba ripens about six years out of seven.

A. H. PETTIT.

MR. HAGAMAN'S EVIDENCE.

Jeremiah Hagaman, of Oakville, was called and examined.

Strawberry Cultivation.

To the Chairman.—I reside in the centre of the strawberry district, and have been engaged more or less in the cultivation of strawberries. We have had as many as ten acres under cultivation. There are from 100 to 150 acres under cultivation in my neighbourhood. I have not cultivated very many varieties.

The Wilson—The Best on the Whole.

For home cultivation I consider the Wilson variety the best. It is preferable for marketing. Take it all around I think the Wilson is the best berry.

Average Crop Per Acre.

The average crop of strawberries per acre would be 75 or 100 bushels. This of course means that they must be well cultivated.

Wholesale Price—The Market.

The wholesale price of the fruit has been from five to seven cents per quart. The berries are shipped to Toronto more than to any other point, and from thence a great many are sent to Montreal. From Toronto they find their way all over the Province. Toronto and Montreal are the centres from which the berries are distributed.

The Business Profitable, but the Limits Reached.

I think it is a profitable part of our fruit industry. I think we have reached the limits of profitable strawberry culture; it does not require to be increased at the present time.

Canning, or Preserving.

Mr. Dymond: Do you think by introducing canning or preserving to use the surplus crop, that the industry could be profitably conducted, and the area of land under cultivation increased?

Mr. Hagaman: I think it might, in case the canning of strawberries proves successful, but I have no experience in that line. If they could be successfully canned and sold, it would increase the growth very much.

Some Sorts Richer and Better than the Wilson.

I think there are some other strawberries richer and better than the Wilson, and more pleasant to the taste, but there are none of them that would carry or keep so well as the Wilson, nor produce so large a crop. So far as I know I think the Wilson is ahead of all.

The Wilson a Prolific Plant.

It is considered a first-class fruit, but of course it is a little tart. It yields more than any other berry we have had to do with, but we do not consider it the sweetest. We have not tried many of the lately introduced berries. A good many have been tried by others in Oakville, but they have not succeeded well.

Birds—Insects.

I do not find that birds destroy strawberries at all, nor are there any injurious insects which destroys the crops. There is an insect, a small fine one, which injures the leaf sometimes in the fall. It works on the leaf and sucks out the juice.

Soil—Manure—Preparation of Land.

The soil most suitable for the growth of the berry is a sandy soil, or sandy loam. The ground should be highly manured, and if it were summer fallowed it would be preferable; or you can raise turnips, or something like that, and the next season raise strawberries. I would recommend summer fallowing, or a root crop, to precede the planting of strawberries.

Spring Planting Preferred.

The vines should be planted from the first to the twentieth of May. I prefer spring planting to fall planting, and very seldom plant in the fall. It does not pay to plant in the fall. You have to protect them through the winter, and then, in the spring, they are worth no more than those planted in the spring. They have to go through another season's operation before you get any fruit from them.

Mode of Planting

Where the land is well prepared I would plant four feet between the rows and two feet in the rows. I do not recommend the hill system of culture at all. I don't think it has any advantage for amateur work.

Renewal of the Vines.

The vines should be renewed once in two or three years; by many it is considered well to renew them every year. I think it is best myself to take only one crop off them. The extra quality of the crop would repay replanting every year.

Deterioration of Fruit.

After the first year's picking the fruit is not so good and it is generally smaller. I would not replant on the same piece of ground, but would select a new piece.

Management of the Land.

Mr. Dymond: What land do you generally use if you are changing? What would you adopt as a sort of rotation?

[*Mr. Hagaman.*]

Mr. Hagaman: I would put in some hoed crop, such as turnips or potatoes, rather than grain. It is a question whether strawberries would be a profitable crop in connection with general farming.

Strawberry Growing in Connection with Farming.

Farmers generally neglect their strawberries in attending to their other work. The period of the year requiring attention to the berry is the period that the farmer is the busiest. Generally speaking, I would not recommend farmers to go into strawberry culture.

Annual Shipments from Oakville.

Mr. Dymond: Do you know what is the quantity of strawberries shipped annually from Oakville?

Mr. Hagaman: About 4,000 to 4,500 cases, as near as can be ascertained; or 216,000 baskets. This does not include what is shipped otherwise between Hamilton and Toronto, which would probably amount to as much more as the above figures.

The Wilson a Favourite.

The Wilson is a general favourite with all the great fruit growers. I am not now so large a grower as I was at one time. Thirteen acres is the largest amount of land cultivated by one man. The cultivation of strawberries in Oakville has existed about ten years.

Commencement of Strawberry Growing at Oakville.

Mr. Dymond: What led to the industry locating itself there?

Mr. Hagaman: It happened to be introduced there in the first place. A man named Cross introduced it first there, although an agent from the other side came there and went into partnership with him, and they set out four or five acres. From that time others set out their vines and followed the industry.

The Land Otherwise Worthless.

The great supply of our strawberries is obtained from land that is worthless for other crops; that is to say without manure and proper drainage.

Strawberries on a Clay Soil.

Mr. Saunders: Have you had experience of strawberries upon a clay soil?

Mr. Hagaman: I have not grown any myself, but I have seen them grown on clay soil, and they have not succeeded well. I have seen them grown on muck and dark land mixed with clay, but they do not succeed there.

Stable Manure—Phosphate—Salt.

We have used a fertilizer, but prefer stable manure. We have also used phosphate, but it seemed to be too hot for them, and we discontinued it. We do not use salt, nor have we used liquid manure at all. I think that would be good.

Liquid Manure.

The farmers in our neighbourhood don't make any endeavours to preserve the liquid manure. I think it would be well for farmers to try and preserve the liquid manure for strawberries.

[*Mr. Hagaman.*]

Cultivation of Grapes—Varieties.

I have an acre and a half under grape cultivation. The Concord succeeds best. I cultivate also Rogers' Nos. 4 and 15, and Delaware. I never cultivate any other variety except the Clinton, which we raise for wine.

The Concord Most Profitable.

We find the Concord to pay the best. We grow the grapes chiefly for market. The price averages in Toronto from three to six cents. The grape culture has paid well with us.

Frosts—The Seasons.

The frost only injured us once, a year ago last spring. The season is generally quite long enough for grapes.

Diseases—Insects—Birds—The Robin.

We have no disease in the roots or leaves. There are no insects or birds to injure them. I never found the robin to attack grapes; we have plenty of robins around us. I have almost invariably a good crop of Concords.

Clinton and Concord for Wine.

We do not use the Concord as a wine grape. I could not say how it would do as a wine grape. I think, however, it would do well for making wine. I think it should be mixed with Clinton or some other grape. Clinton gives the wine a better colour, and the Clinton is not so sweet a grape. The two mixed together would give the wine a better flavour.

Twelve Tons on an Acre and a Half.—Planting.

I grew 12 tons of grapes on my acre and a half last year. They averaged me last year a little more than 4½ cents a pound. We have the vines from 8 to 9 feet wide between the rows, and 14 feet from hill to hill. I would recommend 10 feet apart, and 15 feet in the row. In the row we have to leave room for the vine to run, and if we make it 15 feet, that's only 7½ feet for the vines to run and meet one another. There are about 400 vines in my acre and a half, and the vines are seven years old.

Result of Soil and Good Cultivation.

The crop would be about 60 pounds to the vine. I attribute my good crop to the nature of the soil and good cultivation.

Mode of Training and Pruning.

I support the vines with wires, and in pruning them leave just enough of the vine to fill up the trellis. We use four wires. We begin about two feet from the ground, and then the space equally divided, the upper one being six feet from the ground. We do not prune in the fall, but in spring. My vines are always left standing, but I think it would be well to lay them down during the winter. They have never suffered with me. The soil on which I grow the grapes is not the same as that on which I cultivate the strawberries.

Gravelly Soil—Draining—Mildew.

The soil for the former is a gravelly sand with a clay bottom. It is not drained—my

land does not require draining; no water ever stands on it. In pruning the vines we leave just enough to fill up the trellis. We have had a little mildew, but nothing to hurt the crop. I think the Concords have been freer from mildew than any other variety. I had the Rogers mildewed the worst last year, and they are more liable to mildew than the Concord.

Good Land—Situation—Cost of Land.

There is quite a considerable quantity of land suitable for grape culture back of the lake a little. Grapes don't do well along the lake because the lake air and dampness keep them back too late in the season. A little frost does not hurt the Concords. Land in that neighbourhood costs $50 or $100 an acre. If you wanted to go into grape cultivation and get land near a station you could not get it for less than $100 an acre.

Time Taken to Mature a Crop.

It would take two years before they would bear, and three years to have a paying crop. To obtain 12 tons from an acre and a half the vines would have to be seven or eight years old. I have never renewed my vines; occasionally we cut out the old wood. The life of the vines is unlimited; I don't know how long it lasts. The new wood keeps working out.

Cost of Laying Out a Vineyard.

Mr. Dymond: What is the cost of laying out and fencing an acre of grapes, including the cost of the plants and the annual charge of cultivation and harvesting the crop?

Mr. Hagaman:

I will say 300 posts per acre @ 10c	$30 00
Digging holes for posts	5 00
Wires for same	15 00
Working the land first year	20 00
Putting in posts	4 00
Putting up wires	3 00
Staples to hold wires	2 50
Say 300 vines of Concord @ $8	24 00
Thirty loads of manure for same	30 00
Well rotted manure, if the ground is thin, @ $1.50	45 00
Picking full crops, say 8 tons	20 00
Use of land	10 00

Cultivation of Apples—Varieties.

Mr. Hagaman: With regard to apples, I chiefly cultivate winter varieties, Baldwins, Rox Russet, Golden Russet, Northern Spy, and Rhode Island Greening.

Growing for Exportation.

I grow for foreign shipment. My orchard is young yet. I have not yet shipped apples to Europe, but I have planted my orchard with that view.

Prices Offered and Realized.

This year I will have nearly 300 barrels. The trees are only 12 years old. I am offered a dollar per barrel, the parties to find their barrels, and I to pick them; I expect, however, to get $1.25 a barrel. Last year I got on an average $4 for Russets, and the year before I got $3.37½. These I had kept over till spring. Those prices were got in the Toronto market.

[*Mr. Hagaman.*]

Age of Orchard Bearing—Gradual Increase.

The orchard began to bear when six years old, the first crop being 20 barrels, the next 50, and so on. Three years ago I only got about 20 barrels. The Rox Russet is the best keeping apple of the whole.

Treatment of the Crop.

I leave the crop as long as I can out of doors, or in an open building, till I am afraid of the frost, and then I move them into the cellar.

Winter Treatment.

I keep the cellar as cool as I can without freezing the apples; the cooler the better. There is no trouble in keeping these apples if you can keep them cool enough.

Rox Russet—Spy—Baldwin.

The Rox Russet is not very tough in the wood. The Baldwin is not so healthy in the wood, and is sometimes killed on the tops. The Golden Russet grows very hard wood, and that of the Northern Spy is also hard. The latter is the longer to arrive at maturity.

The Orchard—Borers.

My orchard is composed of twenty acres, set out twelve or thirteen years ago, and two acres set out six or seven years ago, and I think I have six more that have been set out only a year. I find the borers destroy the trees sometimes, but my experience is that the borers never injure a tree that is kept thrifty. If a tree gets injured, or is allowed to stand without cultivation, the borer will destroy it. I have never adopted any other means for their extermination than to hunt them out with a knife.

Cultivation Necessary.

I prefer cultivation constantly for an orchard. I would keep it up for ten years. I have all my orchard under cultivation, but I calculate to seed it down now.

Summer Apples.

I grow some summer apples, but I don't give a great deal of attention to them, nor do I grow any great quantity. I have about a hundred trees of Red Astrachans, which I think will be a profitable apple to sell. These are in my new orchard of five years' standing, but I have not yet got fruit from them. I don't cultivate very many pear trees.

Plums—The Curculio.

I have about 400 plum trees. The blue plum seems to be about as profitable this year as any. We have grown the Lombard, Washington, Green Gage, and several other kinds. We are very much troubled with the curculio in plums. We adopt the usual method of jarring and catching curculio on trees; this is the only way to save the plums. I have 50 acres of land, and there are only about 12 acres not set out in trees and grapes. The plum trees are not separated from the rest of the trees. There is 25 acres of an orchard of apple trees alongside of mine all in the field. A man, whose orchard of two acres adjoins mine, neglected to jar his trees, and he has not had much of a crop of plums. I find plum culture pays, and it pays to attend to the trees. Plums are cheaper this year than we have ever known them.

[*Mr. Hagaman.*]

Peaches—Prices of Plums—Blight.

We do not grow peaches, not being able to succeed with them. I think our plums brought this year about 60 cents a basket (half bushel). Part of them were sold in Toronto, part in Montreal. Clapp's Favourite seems to be a very nice pear. I sent a few baskets of them to market this year, and they brought about a dollar a basket. They are not so durable as some. We are not troubled with blight in the trees, but six or seven years ago were much annoyed with it. Plum trees are subject somewhat to the black knot. We watch them and cut them off, otherwise they would in time injure the tree. We have no other remedy than amputation.

J. HAGAMAN.

EVIDENCE OF MR. A. M. SMITH.

A. M. Smith of St. Catharines, was called and examined.

To the Chairman.—I have been located for some time at Drummondville, near Niagara Falls, having done business there for ten years. Recently, however, I removed to St. Catharines.

Strawberry Culture.

During the time I was at Drummondville I grew small fruits for market. I went very little into strawberries, but cultivated raspberries largely. For the first few years I cultivated strawberries, but of late I have not done much with them. I don't think I would plant the Wilson exclusively if I were setting out any plants.

Early Sorts Most Profitable.

At present I think there is more money in a very early berry or in a very late one. Every one has gone into the Wilson, and if you could get a berry a few days earlier than the Wilson more money would be made.

The Crescent Seedling.

I think the Crescent Seedling is probably going to supersede the Wilson in many markets. I planted the Crescent a couple of years, and I am satisfied it is ahead of the Wilson in bearing, but it is not as good a shipper. It is not so acid as the Wilson, being a sweeter berry. This fruit has been very cheap at St. Catharines this season, probably not more than four or five cents a quart. The Crescent Seedling ripens about the same time as the Wilson. I have tried several varieties of early berries.

The Nicanor—Early Canada—New Dominion.

There is one we have cultivated called the Nicanor, that, as an early berry, has paid very well about Drummondville. I have a seedling of my own that is a little ahead of that in the quantity and quality of the fruit. It has not yet been sent out under any particular name, but is simply grown there by one or two parties. It has been proposed to call it the Early Canada. I have had some experience with the New Dominion berry. For the local market it is a very fine berry to grow, but it is too soft for shipment. It is later than the Wilson, and will command a much better price. It is a seedling that originated in Drummondville.

[*Mr. A. M. Smith.*]

Size and Colour Important.

Generally speaking early berries are as fine flavoured as late ones. Size and colour tell with the public. The New Dominion will bring 4 cents a quart more than the Wilson. I have not tested the Sharpless sufficiently yet to recommend it as a market variety. I have now some twenty different varieties planted out to test the qualities of each. Some of them have been highly recommended by the Americans.

Soil and Methods of Planting.

I prefer a sandy loam for the growth of strawberries, and prefer planting the berries always in spring. I would not advise planting all varieties in rows. I think the Dominion will succeed better in hills. I think you will get finer fruit by adopting the latter method. Between the rows I usually plant about three and a half feet apart and allow them to spread. If I were planting in hills I would plant about three feet between the rows, and the hills about one foot apart. In the row system I would not think of picking more than two crops, and if the ground was any way foul I would not take more than one crop.

Raspberry Culture.

The fruit I have been principally engaged in cultivating has been raspberries; of which I planted about six acres last spring, and intend planting six more this fall and next spring.

Varieties—The Niagara.

The Highland Hardy, Clark, Philadelphia, Herstine, Turner, and the Niagara, are the varieties that I am planting. I have mentioned the names in the order of their ripening. The Niagara was a seedling of mine. It was grown from seeds I selected from the Clark and Philadelphia growing together. The variety is probably a cross between these two kinds. It has a little resemblance to each of them. It is a red berry, a little dark, but not so dark as the Philadelphia. It is not so bright in colour as the Clark. I have not tested the Cuthbert or Queen of the Market, mentioned by Mr. Morris. From what I have seen of it, I am inclined to plant a quantity of them.

Markets and Prices—Cost of Planting.

Raspberries will not carry a long distance. I intend to find my market in Toronto. I am within less than a mile of the boat at Port Dalhousie. In Drummondville I found a local demand in supplying the hotels about the Falls. I realized from 10 to 15 cents, sometimes more; never less than 10 cents. The raspberry plants for an acre would cost about $30, and the preparation of the ground and planting out would not be more than $8 or $10 more. Fruit land is worth about $100 an acre in my district.

Manure—Cultivation.

I usually manure my raspberries after they are planted. I use barn-yard manure and ashes, and apply them usually in the fall. Usually I scatter the manure around, and then run a light furrow, and partially cover it with earth. The cost of cultivating them after they are planted is not very great. You have to keep the ground clean and keep down the superfluous suckers. A man, with a horse, should cultivate four or five acres, doing the majority of the work with the horse and cultivator. My usual method is to cultivate them perhaps five or six times in the course of the season, and then I have three or four men to do the hoeing. I should think an acre could be cultivated for $10 a year. The pruning would be worth $4 or $5 more.

[*Mr. A. M. Smith.*]

The Canes—Produce—Picking.

The canes last usually five or six years. You can raise about 1,500 quarts a year on the average—I have raised 2,000 quarts—to the acre. Raspberries are often sold at 6 and 7 cents, but if they come in in very good condition they command from 10 to 12 cents wholesale. I would not think it profitable to cultivate a raspberry bed after five or six years. Picking costs about 1½ cents a quart. We get the common baskets for ½ cent each, but I have generally used a more expensive basket, which is much stronger, and the berries carry much better in it. These cost about 3 cents each. It would not pay to use them except we got them returned. I find it is better to ship the berries in pints when carrying them a long distance. The rows of canes should be planted about six feet apart, and three feet in the rows. For amateurs I would suggest the Franconia, but the canes are a little tender and would require covering up in winter. I have not found any insects injurious to the crop. I am troubled very little with the saw-fly. Sometimes robins at the beginning or close of the season give us a little trouble, but nothing very serious. They don't destroy sufficient of the fruit to be a very serious matter.

Method of Cultivating.

My method of cultivation would be somewhat different from that of Mr. Morris. I do not tie up canes, but cut them back when young, and they grow stocky and self-supporting. I usually let some of the canes come up between the hills. I remove the old wood just as soon as the fruit is off. I cut out the whole of the old wood immediately after picking the fruit. There is another point—I generally do my cultivating pretty early in the season, and try to avoid cultivating them after picking the fruit. This is to get the wood ripened up for winter, Sometimes it is necessary to go through and weed them out after picking.

Blackberries.

I have cultivated blackberries to some extent, and find the Dorchester and Kittatinny are the best. Sometimes the latter variety are affected by winter. They are a profitable crop. I intend planting more extensively than I have done. Blackberries yield more than raspberries, probably 2,000 or 3,000 quarts an acre. The average price is higher than raspberries, while the price of planting them is about the same. For one or two years there was a kind of blight on one of my varieties. I could not discover an insect, but just before the time of ripening my canes blighted. For the last two years they have been exempt from it.

Black Caps.

I have also grown black caps. The varieties that succeed best are Davison's Thornless, Dolittle, Mammoth Cluster, Seneca, and Gregg. From what I have seen I think the Mammoth Cluster and the Gregg the best. The yield of black caps is not up to the yield of red raspberries, being usually less. They are not so profitable as red raspberries or blackberries, except where you have to ship a long distance, or for drying. I would plant blackberries a little farther apart than raspberries, putting them in rows about seven or eight feet apart, and about four feet apart in the row.

Peach Culture.

I have been engaged in cultivating peaches. I think I planted the first peach orchard of any extent in Grimsby. That was about twenty-five years ago. I had heard at that time of the disease called the yellows being prevalent in New Jersey and Delaware. This disease was first known about 1800. I know that twenty-five years ago it was quite bad in New Jersey. In some places they were obliged to cut down their orchards and stop growing for some time. They discontinued growing for several years.

[*Mr. A. M. Smith.*]

Early Sorts.

There is a great advance within the last twenty years with regard to the time of ripening. Then, Early Purple was our earliest, while now we have varieties that are three weeks earlier. Of early varieties I would mention Alexander, Early Canada, Early Beatrice, Early Rivers, Old Hale's Early. The Early Rivers is a very promising variety, coming in right after the Early Beatrice. I think there is more money at present in very early and very late varieties than in any others. The majority of people have gone very extensively into Crawfords, and have thus overstocked the market. The consequence is that when Crawfords are ripe there is a glut of peaches in the market. There has not been a great amount of peaches shipped from St. Catharines, but considerable quantities from Jordan and Niagara.

The Yellows—Borers.

The yellows has not prevailed much about St. Catharines, but there are very few orchards there. In the vicinity of Drummondville however, the orchards are nearly all destroyed. They have in a great measure rooted the diseased trees up. I have seen considerable of this diseased fruit in the market this year, and have heard of people complaining of sickness after eating this fruit. A friend of mine in Toronto said that somehow the peaches didn't taste as good this year as usual, and that they rather made them sick, they thought. I inquired of the character of the fruit, and from what I could learn I thought it was the yellows that was the matter with them. The peach does not suffer from the curculio to any extent, but the borers are rather bad. We have one or two promising seedling peaches in Grimsby.

Fruit Drying Industry.

A fruit drying establishment has recently been started in St. Catharines with a capacity to dry 150 bushels of apples a day. They don't do anything much in drying peaches, having been in operation only a short time. I have no doubt there is a good opening for such a business. The same party has an establishment also in Jordan. This industry is something new to Canada, but not to the States.

The Apparatus Used.

The apparatus used is called the "Scientific," and is an improvement on the "Alden," although the principle in the two is the same. It is an upright frame or box built over a furnace, and on each side there is a belting like a straw carrier. As the fruit rises on the slats it is subjected to the hot air of the furnace. The temperature required is from 160° to 170°. The fruit comes out all dried.

Bleaching Process—Paring and Cutting.

Before being put in the dryer the fruit goes through a process of bleaching to make it white. That was formerly a secret process, and people wondered how the fruit was rendered so white. The fruit is bleached with sulphur, being put on little trays which are placed over burning sulphur, and allowed to remain there a short time. They have machinery to cut up the fruit. These parers are worked by women and girls. One girl pares the fruit; another cuts it into sections, and takes out the bruises and bad pieces. I think each tray is allowed to remain over the sulphur when bleaching for about five minutes. The bleaching is done as soon as the apple is cut. Before the apples go through the drying process you can taste the sulphur, but not after they have been dried. After the fruit is dried it is packed in fifty-pound boxes. They intend to ship the apples from the St. Catharines' factory to England. I have seen several of these drying establishments in the States.

[*Mr. A. M. Smith.*]

Cost of Drying—Press.

I have heard it stated that the apples can be cut and prepared for drying for 6 cents a bushel, and the proprietors only pay 15 cents a bushel for the fruit. About five bushels of apples make a bushel of the dried fruit, which weighs twenty-two pounds. At Lockport they sold the dried fruit last year for 12 and 18 cents a pound, while ordinary dried apples bring only 4 or 5 cents. I don't know what the price is this year. For drying, the best apples of course are not used. It would not pay to dry and ship the best quality of winter apple, but it would to dry the second-class ones.

Selecting Apples for Market.

In picking apples for market we usually separate them into first and second-class. The first-class comprise the best, while the second-class include wind-falls, and wormy and bruised fruit. I have packed some for foreign shipment, but not a great deal for the English market. From reports I have heard, the highest prices are brought by the King of Tomkins County, Spitzbergen, and Newtown Pippin.

Peaches on Plum Stocks.

I have seen peaches growing on a plum stock. Several years ago it was argued peaches would be hardier on a plum stock; we tried the experiment, but didn't find anything in it. I am inclined to think the yellows is communicated from the blossoms.

Red and White Currants.

I have not grown many red or white currants for market. For market I would recommend the red and white Dutch, Versailles, and White Grape. I think the market is already pretty well supplied with these small acid fruits. I don't think there is much to be made out of red and white currants, the gardens about towns being usually well supplied with them.

Black Currant Growing.

I think black currants might be grown with a profit, although I have had no experience. I lately visited a gentleman in Jordan who grows black currants. He wrote in answer to a letter of mine the following reply, which contains some information respecting black currants:

"Jordan Station, *Aug. 4th, 1880.*

"Sir,—In reply to your request about small fruits, I would say that for black currants I would prefer a black loamy soil, would plant four by seven feet, and cultivate thoroughly, but not manure heavily. Always be sure to cut back one-half the growth every year, which may be done late in the fall or in the early spring. The average yield per acre, in an ordinary season, for red and white currants, would, I think, be 100 bushels, with an average price of $1.50 a bushel. For white and red currants I prefer sandy soil, and the same planting as the black. An average yield of black is 125 bushels an acre, with an average price of 6 cents per quart. I will not say anything about the profits per acre, as that can easily be figured up by interested parties.

"C. M. Honsberger."

I have not tried Lee's Prolific to any great extent. As far as I have seen it I don't consider it anything ahead of the genuine Black maples.

[*Mr. A. M. Smith.*]

Legislation for the Yellows.

We have tried to do something for the extermination of the yellows, and I would like to urge the importance of having some compulsory measures taken to prevent its extension. The only thing you can do is to prohibit the importation of trees from localities where the disease is known to exist. That of course would be a difficult matter to do. The Legislature of Michigan has passed a bill compelling parties to cut diseased trees down. We tried to incorporate something of that kind in the bill for the suppression of the black knot, but it was thrown out. I think it would be desirable to have some kind of legislative action towards the extermination of trees diseased with the yellows. I would have commissioners appointed to look after the disease, and let complaints be laid to them, and they then warn the parties. The Canada Thistle Law has been enforced about Drummondville, but I know that generally it is considered a dead letter. I think if it was generally known that there was a law against diseased trees, and that it would be enforced, people would be apt to be cautious. It is easily told if a tree is diseased at the time of bearing from the colour of its fruit.

How Yellows may be Propagated.

It is generally acknowledged that the disease can be propagated from the pits. It is customary for boys to gather peach pits and dispose of them to men, who again sell them to nurserymen to plant. There is a danger here, and nurserymen should be cautious where they get their pits from.

The Yellows very Contagious.

The disease spreads very rapidly. I planted an orchard with a man four years ago last spring in Stamford. Three years ago this last fall, there was one tree which I saw was affected with the yellows. I told him to have it cut down, but he said it was a pity, and allowed it to stand. The next season there were twelve trees affected by the disease, and the year following there were about 200 diseased. To-day there is not a sound tree out of the 250 originally planted.

The Disease Easily Detected.

I saw some of the diseased peaches in a store in Toronto lately. The dealer said that they were a new variety of peaches, not knowing they were unsound fruit. There is no trouble in telling the diseased fruit. It is always blotched or spotted with red, and red inside, particularly about the pit, and clings more or less to the pit. If slightly diseased the flavour may not be wholly destoyed, but if very bad they will be insipid and worthless. Many towns and cities in the States have prohibited their sale in their markets under heavy penalties, and I think if our own towns and cities would do the same they would confer a benefit on the inhabitants.

A. M. SMITH.

MR. MORRIS' EVIDENCE.

Edward Morris was called and examined.

The Pelham Fruit District.

I am engaged in the nursery business at Fonthill. I have been ten years in the business there, and have been engaged in the culture of fruit about fifteen years. I grow fruit for market. For market I grow small fruit, but for my business I grow all kinds.

[*Mr. Morris.*]

Fonthill is four miles from Welland. There are some very extensive orchards in the township of Pelham, some of sixty acres. These orchards contain all kinds of fruit, apples, pears, grapes and peaches.

Orchard Planting.

To make the growing of orchards a success I would advise planting trees about three years old, and what would be called "half standards." An apple tree with a three feet stem would be a half standard, that is, branching out at a height of three feet from the ground. It is against nature to grow a tree with a bare stem, exposed to the sun and weather; it tends to make the tree diseased. If the limbs are allowed to shade the trunk the tree is always healthy and free from borers, and it tightens the bark. I would start with a low trunk. I know a tree will grow in proportion to the lowness of the stem. The shorter the stem the faster the tree will grow. I have demonstrated this. Another advantage is this, that you can step into the tree and gather the fruit, and at the same time if the first limbs are brought up you can work with a team as well as among tall stem trees.

Training Fruit Trees.

I would train trees to a flat, spreading head, and keep them from running up. Try to make it spread out. I would start three feet from the ground and allow it to branch, and turn my side branches up to allow of horse culture underneath; above that the tree should spread out as much as possible. These remarks refer more to apple trees. I would not care to have pear trees with more than a foot or two of stem, and the same way with peach trees. I would favour growing them without any stem at all. I think cherries should be grown without a stem too.

Best Market Cherries.

The cherries I have cultivated are Napoleon Bigarreau, Great Bigarreau, Black Tartarian, Black Eagle, and Downer's Late Red. These and the Early Richmond are the best market sorts. The May Duke is a very good variety.

Summer and Fall Apples.

Of summer apples the Red Astrachan is the most profitable. The fall apples most profitable to the grower are the Fameuse, Sherwood's Favourite, and Duchess of Oldenburg. The latter will grow in any part of Ontario

The "Wealthy" Apple.

There is another new apple called the wealthy, as hardy as the Duchess of Oldenburg, and bearing later in the season. The fruit of the Wealthy is of the same character as the Fameuse. It is quite a new variety. I think myself it is going to take the place of the Fameuse. It is better than the Fameuse because it is cleaner on the outside and without scabs. It is a little larger, as tender, and I think has a little better flavour than the Fameuse. It originated in Minnesota, the original tree there being about sixteen years old. It bore when it was five years old from the seed, and it has borne a heavy crop ever since. It is being planted very extensively in Minnesota, in fact the people have gone almost wild over it. I hardly think it would be a valuable apple for exportation. It would chiefly be advantageous to new settlers on account of its bearing so soon and being so hardy. This variety and the Duchess of Oldenburg would be the best apples for the cold parts of the country.

[*Mr. Morris.*]

Winter Varieties—American Pippin.

The winter apples most esteemed in my district are the Baldwin, Rhode Island Greening, Rox Russet, Mann, and American Pippin. In our section the American Pippin has been the most profitable. It is an apple that is not very well known. It is of medium size, about the size and shape of a Baldwin, but green, striped with dull red. It will keep till June. Its shipping qualities made it very valuable, it being considered the best to ship. This apple will generally bring from 25 to 50 cents more than other varieties. The apples are generally shipped to Montreal from our place. The buyers there ship them to hot countries. It has an enormous crop, and bears every year. I am not engaged personally in shipping apples.

Pears—Varieties.

Of pears, the Bartlett and Duchess d'Angouleme are the most profitable. There are other varieties, of course, which are good. Clapp's Favourite, Beurre Clairgeau, Beurre d'Anjou, and Flemish Beauty. For winter use the best are the Lawrence and President Drouard.

Blight—Preventive Measures—Plums.

Some of my varieties have suffered from pear blight. I am interested in a three-acre pear orchard, but there has been no blight in it yet. For preventive measures we are washing the trees with sulphur and lime. We mix up a pailful of lime and throw in about half a pound of sulphur, and apply that mixture to the trees. A considerable number of my neighbours have suffered from blight. Another plan I adopt to prevent blight is to allow the limbs to grow right from the ground. I think one cause of injury to pear trees is letting them have long naked stems. You often see a dead spot at the bottom of the trunk due to that cause, although mostly attributed to blight. Plums are not cultivated in my neighbourhood to any extent for market.

Peaches—Apricots.

There are a great many peaches grown about our vicinity. The trees do not suffer with us from the winter; sometimes the buds are killed. The varieties of peaches that ripen earliest are the Alexander and the Early Canada. The most profitable for market this year have been the Alexander and the Mountain Rose; in fact most of the early kinds, before the Crawfords, were profitable. The Crawfords brought prices down. We have not suffered from the yellows in our section. The peaches have not suffered from curculio in our district. The trees are not injured by borers if they are healthy and kept cultivated and thrifty. The Apricot is not grown much, as it is subject to the curculio. In other respects it is as easily cultivated as peaches.

Grape Culture.

Grapes are largely grown in our district. The Concord succeeds best. Perhaps there is more money in them at their low price than in the finer kinds. I would recommend Rogers' No. 4 for amateur cultivation; No. 15 also, and Salem. No. 43 is a very good one. Diana and Delaware are good for amateurs, and for market as well. I have been propagating a new grape, the Pocklington, a very strong grower and very healthy. I would prefer this grape to the Concord. It is nearly white in colour, with a very delicate bloom on it, and has very large bunches. I would also recommend the Brighton, and Moore's Early. The ten varieties I have mentioned are the best. The best soil for grapes is a strong gravelly loam. We have planted the rows ten feet apart, and the vines twelve feet apart in the rows. Perhaps they would be better a little farther apart. We have not yet had a great crop of grapes to dispose of, but the demand has been good.

[*Mr. Morris.*]

I think it would pay well to raise Concord grapes at three cents a pound. A year ago last spring there was an insect that attacked the blossoms of the grape vine; it is called the grape vine flea beetle, but it has not troubled us this year. Birds do not destroy the grape.

Strawberries—Preferable Varieties.

I grow strawberries to a considerable extent. For the market I prefer the Wilson, Captain Jack, Crescent Seedling, Sharpless, and Monarch of the West. The Sharpless is three or four times as large as the Wilson, and it has a better flavour It requires trouble to raise it, nor can it be shipped any distance, and another objection is that it lies flat on the ground on account of the berries being so large.

Captain Jack.

If I were planting out five acres I would plant a good many varieties. Of the lot I think I would prefer Captain Jack. It will yield more than the Wilson, and carry to market better, and keep its colour better. It is so much like the Wilson that they can hardly be told apart. In acidity it is about the same as the Wilson, and it requires moist ground.

Crescent Seedling for Farmers.

The Crescent Seedling, I think, is a very profitable berry. For farmers I would prefer it to any, because farmers neglect their berries, and this one will almost take care of itself. I think it will bear more than the Wilson. I should think strawberries produce about a hundred bushels to the acre. I think we shall in time have a sweeter berry which may be transported, but we have not attained that yet. We plant the rows three and a-half feet apart, and from fifteen to eighteen inches in the row. I don't recommend the hill system, even for amateurs. I don't find any birds or insects injuring the strawberry.

Gooseberries.

Of gooseberries I would recommend the Downing Seedling as the most profitable and best berry, and freest from mildew. The White Smith is a variety highly esteemed. I have not heard that the American gooseberries this year have been subject to blight.

Raspberries.

The most successful variety of raspberries is a new one called the Queen of the Market. I would give the preference to this berry. It is red in colour. The Philadelphia cannot be compared with it in size at all. It is very large, firm, and of good quality. There is another raspberry, called Niagara, that is very good too. It is a red berry, and originated in Drummondville. The Queen of the Market is an American variety. The Niagara I think is as productive as the Queen of the Market, and its quality is as good, but it is hardly as good a shipper. The Queen of the Market is nearer in size to the Franconia than any other, but it is larger than the Franconia. I have not grown any of these for market, merely for plants in the nursery business. Of the black raspberries I would name the Mammoth Cluster and the Gregg as the best. I am not cultivating any white raspberries for fruit. We have a stock of the plants, but they are not called for much. I would not recommend them for growth.

How to Plant Raspberries.

In planting raspberries I would recommend them being planted in hills say three and a-half feet one way and five feet the other; and only one plant in a hill. We do not prune red raspberries at all, just let them grow up, and tie them together.

[*Mr. Morris.*]

The Fruit of the District.

The area of fruit culture in my district is constantly increasing. There is a profitable market for all descriptions of fruit. I don't think any other fruit besides apples has been exported. We are rather deficient in quality of pears. Apples are the only fruit in which there has been a surplus in this country.

A Canning and Drying Company.

We have organized a canning company in our neighbourhood. We use the evaporating process for drying. The evaporator we have selected is called the Williams; it evaporates about 200 bushels a day, and the fruit is perfectly white after it is dried, and when it is cooked again it retains its original flavour. I am speaking of apples, but of course it dries peaches or anything like that. In my opinion it is going to change the way of marketing and shipping fruit. I think in a few years the bulk of fruit is going to be shipped in that way. As soon as Europeans find out that the dried is as good as the green fruit they will use it altogether, or nearly so. It is going to reduce the freight and extend the market for fruit. This process is, I believe, generally adopted in the States. We have not yet made any arrangements for foreign trade in this direction. Ours is an incorporated company called "The Fonthill Canning and Fruit Drying Company." In the States they are sending these dried apples to Russia.

EDWARD MORRIS.

MR. TOLL'S EVIDENCE.

Sittings to take oral evidence, held at Chatham July, 1880. *Present*—Messrs. Saunders (Chairman), and Dymond.

James C. Toll, of Raleigh, called and examined.

Apple Culture.

To Mr. Dymond.—I grow apples, peaches, and plums, and have an orchard of apples about twelve or fourteen acres in extent. We grow winter apples chiefly. The Rhode Island Greening is the most profitable apple we have. We generally ship our apples to Montreal and Chicago. The Rhode Island Greening keeps well during the winter. Apples should be well culled and put in good clean barrels, and these should be stored in cellars. Our winter apples are nearly all shipped away. There is a large area of land in the county under apple culture. We have more orchards along the lake than elsewhere, as apples do not do so well on clay soil. The average price realized per barrel is about $1.25 exclusive of the barrel.

The Northern Spy and the Rhode Island Greening.

We cultivate the Nothern Spy and we find it a very good apple, but it is a long time coming into bearing; the trees do not begin to bear paying crops until they are about fifteen years old. The Rhode Island Greening comes in in seven or eight years; it never winter-kills with us.

The Twig Blight.

We have the twig blight considerably this year, but I don't think it interferes with the crop in any way; it just seems to affect the new growth. I have examined the twigs, but have never been able to find any insects or their eggs.

The Borer the Codlin Worm, and Tent Caterpillar.

Our trees are liable to the attacks of the borer; we have the kind which has a large flat head, and it works mostly on trees that have been grafted. I have never made any

application to the tops. When the tops are cut off the action of the sun browns the bark on the side of the tree, and the borers work in those places. My experience is that they do not attack a healthy tree. When I find them I cut them out. We have a good many codlin worms in the fruit, and it affects the price of the crop considerably, as buyers will not take apples that have worms in them. The Greening is as liable to their attacks as any other varieties. No measures have been taken to destroy them. The tent caterpillars are not very injurious to the foliage of the trees.

Treatment of Orchards.

I never seed down my orchard, and I think it would be a bad plan to do so, especially if the trees were young. I have one orchard twenty-three years old, another fourteen and another eight. One of my orchards is on a gravelly ridge; I never ploughed it, but I manure it well. I think orchards should be cultivated.

To Mr. Dymond.—I don't think the leaf gall seriously affects the grape vines.

Peach Growing.

I have grown peaches to some extent. The trees stand the winter well, but in former years they were cut back periodically. Some winters used to destroy the trees, but the fruit buds have not been injured by a low temperature within the last few years. We have the Early Crawford, the Late Crawford, the Honest John, and others. I have some trees of the Early Louise set out, but they have not fruited, and I have also some of Amsden's June. Hale's Early is about the most profitable of any for market, though the fact that it rots so badly detracts from its profitableness. I think the Early Crawford brings higher prices, but doesn't yield so largely as Hale's early; the curculio affects them. The home demand is not sufficient to consume the crop, and we ship the surplus to different parts of the Province. The price realized averages $1 per bushel, but sometimes we get $2 and $3 for extra nice ones.

A Choice Seedling.

We have some seedlings, and I have a tree of one, whose fruit I would not give for almost any other fruit grown. The fruit is not quite so large as Hale's, and its flesh is dark yellow on the inside. I have taken no pains to propagate the seedling. I think it would be well to propagate the seedling I have mentioned, as it is a good bearer and hardy. We have not been troubled with the yellows, but all the varieties have been attacked by the curculio. The peach borer doesn't trouble the trees very much, and we have no other insects injurious to the tree. I find that leached ashes heaped around the root of the tree are a good remedy for the borer. On the whole, I think peach culture right along the shore of the lake is profitable.

Peach Orchard Planting.

To Mr. Dymond.—I have planted my trees too thickly, and if I were planting again I would put them fully eighteen feet apart. For trees in full bearing two and a half to three bushels per tree, is about the yield in good years, but in some years the yield is much less. Peach trees are short-lived. They will keep up a good yield seven or eight years, but they will require six or seven years to attain the age at which they will yield as much as I have stated. Peach trees cost me 15 cents a piece. I purchase mine at Munroe, Mich. We adopted no particular means of getting rid of the curculio on the peaches, though we did on the plums.

Plum Culture.

I grow more plums than any other one in this county. I have one orchard with 100 trees, and another, a young one, with 200 trees. My favourite varieties are Pond's

Seedling, the Bradshaw, the Lombard, and the Imperial Gage. The bulk of my trees are Imperial Gage, but if I were planting again I would plant largely of the Lombard. There is a demand at home for all I can grow, and the price varies from $2.50 to $4 per bushel. I do not ship any to a distance.

The Curculio.

The plum curculio is very troublesome, but by jarring the tree and giving them a great deal of attention I can get a crop in spite of them. The trees should not be jarred less than twice a day, and if the weather is damp and warm they should be jarred three times a day. I gather them in sheets placed upon wheelbarrows, which I run along upon each side of the tree. They can be carried in the sheet as its moving keeps them quiet. We empty the contents of one sheet into another, and then throw the insects into the fire.

Black Knot—Birds.

The first we saw of the black knot was last year. We have a small blue plum, very hardy, something like the Damson, and it is less troubled with the curculio than the others. We have no birds that trouble the plum crop.

Salt—Seedlings—Yield of Fruit.

I sowed salt on my plum orchard two years ago, but I cannot say whether it has been a benefit or not. We have no particular seedling plums. I plant plum trees fourteen feet apart each way. I have got as high as four and a half bushels off one tree, or $14 worth. The tree I speak of is a Lombard. My young orchard is not bearing yet, though the trees have been planted out five years. During the year in which I obtained four and a half bushels from one tree I only cultivated about 100 trees, and my plum crop brought me $214. Some of trees had died out and we replaced them with peach trees. I had only three trees of the Lombard variety. The yield I speak of was a very exceptional one. When the trees bear a very heavy crop one year they don't bear the following year, and I think the Lombard tree in question has suffered from the heavy crop it bore that year. I cannot give any reason for the appearance of the black knot last year. I cut it off as soon as I found it and so got rid of it. I have not brought the seedling peach which I mentioned to the attention of the Fruit Growers' Association.

JAMES C. TOLL.

Sittings to take oral evidence, held at Galt, August 18th, 1880. *Present*—Messrs. Brown (Chairman), and Dymond.

MR. D. CALDWELL'S EVIDENCE.

Mr. David Caldwell was called and examined.

Fruit Culture in Waterloo.

To the Chairman.—I grow fruit. The great drawback to our growing it in our particular climate here is the early and late frosts, especially the early ones; that is, what we call the June frosts, and frosts even before that that injure the blossom. My land is upon a high hill.

The Northern Spy.

The apple that succeeds best with us is, I think, the Northern Spy for a winter apple. Those persons who go into fruit growing for shipment consider it the leading apple for that purpose. The only objection to it is that it is long in bearing;

[*Mr. D. Caldwell.*]

but it is such a valuable fruit and such a long and steady bearer that it is preferred and there is money in it. The fruit growers along the Ontario shore have found their way up to our nursery, and they have tried the trees grown by us where they are away from the influence of the lake, and they find that our trees when growing beside others are the thriftiest. Taken from our climate to a better they grow better than they do here. This apple is looked after both for exportation and for home consumption, but it is particularly good for exportation.

Rhode Island Greening.

The next best apple is the Rhode Island Greening, for winter. It is both a fine dessert apple and a baking apple. It is also a good shipper. Another thing that has attracted those growers up from the lake shore is our conversations with them when we meet at the agricultural exhibitions and interchange ideas.

Low Stems Preferred.

For instance, in speaking with Robertson, of Oakville, the great strawberry grower, and such men, I have said to them, "Why have your trees so high in the stem?" That I consider a great objection. I find that a tree with a low stem comes into fruit sooner than one with a high stem, and then if you wish to barrel your fruit for exportation you can take it off the tree with your hands and handle it as carefully as you would eggs, which you would not be able to do if the stem was high. The same idea had struck Mr. Robertson also. With the view, therefore, of his trees being low, I recommended him to take those that were two or three years old instead of what were four or five years old. The two or three year old tree will go ahead of the four or five year old one in a few years. Another advantage of choosing a young tree is that you can take it up with nearly the whole of its roots, but in taking a tree up in the way that trees are generally removed from a nursery, you deprive it of a great many of its roots if it is older, and then it requires two or three years to recover.

Seek-no-Further—Æsopus Spitzenberg.

The Seek-no-Further apple, which belongs to the family of the Spitzenberg, is also a fine apple. So is the Æsopus Spitzenberg; but the tree is usually delicate and the fruit seems to be so subject to worms and insects that we find it unprofitable. It, however, commands the highest price in the British or any other market. I see the Seek-no-Further apple labelled "Spitzenbergs;" and they come so near the real Æsopus that, when they go into the British market, they are not questioned, but command a good price.

Red Astrachan and Duchess.

Upon the whole I think that the best early apples are the Red Astrachan and the Duchess of Oldenburg. They are fine, hardy, prolific fruit, and among the earliest varieties now in the market, and they succeed well here and all over the country. There are several leading varieties of apples.

Pear Culture—Flemish Beauty.

Pears succeed with me. The Flemish Beauties are my preference. They stand the climate well here and in the townships north of this; and I find that everywhere between the two lakes magnificent fruit of the Flemish Beauty variety can be grown, and the trees are thrifty. I grow peaches here. I have a good crop of them this year.

[*Mr. D. Caldwell.*]

Peach Growing—The Wild Plum Stock.

At one time there was so much difficulty in peach-growing that I had to give it up for several years; but since I commenced growing them on the wild Canada plum they have succeeded well. The reason of the difficulty before was that they got winter-killed grown on the peach roots. When grown on the wild Canada plum the peach matures early. The great secret of growing this fruit is to have the wood to mature early. I grow the Early Beatrice peach. I pulled this variety, nice ripe fruit, ten days ago. I have also the Early Crawford and other varieties. I always protect the roots by earthing up in the fall.

The Soil and Situation Needed.

I find that, if you plant a tender tree, such as the peach, upon a high hill, exposed to the north and west, it will stand a more severe winter than when planted exposed to the south or east, or a tree planted in a hollow. The poorest dry knoll that you can get, provided it is high, is the best situation you can have for a peach; but the tree requires good cultivation and good care. It needs a warmish, dry soil. I think you might say that the peach has been, up to these last few years, a total failure in this section of the country on account of the winter-killing There have been peaches grown here for a quarter of a century. They have succeeded well here as wall fruit. I would not like to recommend this as a peach-growing district. Five miles below here in the neighbourhood of Branchton, there is a man of the name of Ward who for many years has never missed raising peaches and grapes. His place is on a high ridge on which the sweet chestnut grows.

The Plum—The Curculio—Yellows.

We should grow the plum here successfully if we could only fight the curculio; we are troubled a great deal by it. We have never seen the yellows in peaches here. My belief is that if the peach is always budded upon the wild Canada plum there will be no yellows. We have had to compete for many years with trees brought from Rochester and Geneva, and away back here in the back part of Luther, and Amaranth, and Artemesia, and all through those northern townships, our trees are taking the lead. Theirs are finer, handsomer trees—we can hardly come up to them as far as appearance goes; but our trees stand the transplanting and the climate better. If I were to force my trees the way they are forced about Geneva and Rochester I should have none.

Temperature—Strawberries.

Dumfries is over 1,000 feet above Lake Ontario. Galt is about 860 above. The average winter temperature here for the coldest months is about 22°, and the average summer temperature about 69°. We have found strawberry growing to pay us very well here. The Wilson is the only variety I have cultivated that there is money in. We ship strawberries, beginning at Guelph, and then send them to Elora, Fergus, and all the towns up along the line. There are just two or three persons engaged in that industry here. Our soil is well adapted to it.

Grape Culture.

We have been growing grapes successfully. The kinds that succeed best here are the leading varieties of the Rogers. The Salem is one of the best. Rogers' number 3 is a good grape, and so are numbers 4, 14, and 19. I consider the Concord the best grape for all purposes, the grape for the million. A considerable quantity of grapes is grown here. I would plant grapes with the trelisses running north and south, so that they would have both the morning and the evening sun. I would plant them on high land with wind-breaks; in fact, that should not be neglected with any kind of fruit or other cultivated trees. I think both grape and peach soil should be a high, dry, sandy clay loam with warm limestone bottom. That is what they have got on the ridge at Branchton.

[*Mr. D. Caldwell.*]

Use of Gypsum.

I have used gypsum both on trees and on farm crops. My favourite mixture is gypsum, ashes and salt. I have sowed two or three hundred pounds of the mixture to the acre there being about equal parts of the gypsum, ashes and salt. The ashes that I use are unleeched.

Prevention of Pear Blight.

Very few nurserymen can succeed in growing seedling pears, owing to the blight, but there is not a sign of blight among my pears. The reason for this is that I have sown this mixture on the surface after the trees have come up. This keeps the plant healthy and in a growing state, and enables it to resist any disease. It stimulates. Almost all our nurserymen, both in Canada and the United States, have had to import their pear stocks from France, they being healthy and strong. I have been asked many times how I could grow pear stocks so well; the application of this mixture is the only reason I know for it.

Soil for Pears.

For a pear to succeed, it is necessary that there should be a good deal of clay in the subsoil. I think a clay soil is also best for the plum—not a stiff clay; a warm, sandy, loamy clay.

Treatment of Manures.

I do not know that there is any department of agriculture that is more neglected or less understood than this of manures. In regard to it, I find that the greatest economy is in making composts. One of the greatest losses that I think the farmer sustains is from the gasses escaping from his manure heap. If we do not turn our manure and decompose it we shall have our land full of all kinds of weeds, especially the Canada thistle. Decomposition of manure goes on very rapidly in our climate, and the gasses escape very rapidly. The great thing is to retain these gases by covering our manure with swamp muck or something else. I have not experimented with gypsum as a means of retaining gases; but I think there is a good deal of virtue in it for that purpose.

Use of Salt—Insect Pests.]

I think, however, there is more real virtue in salt than in gypsum; of the two alone I would prefer salt. I have never tried salt with trees; but I know that salt draws moisture. An animal will eat salt in handfuls, and if it is good for an animal it certainly must be good for a vegetable, because we are so far, away from the sea here that there is nothing saline in our atmosphere, at all. The great pest nowa-days is insects; it does not matter what you grow, there is an insect in it; and no insect likes salt or ashes. I prefer salt and ashes as a mixture. The first thing that drew my attention to salt and ashes was what I saw—I guess it must have been twenty years ago—in the neighbourhood of Guelph. Mr. Anderson, of Puslinch, had run out of manure, and he still had about an acre of land in the corner of a field for which he had none. He had a lot of old ashes lying around, and he went into Guelph and bought some salt, mixed it and the ashes together, and put them on. The crop that he had in was turnips. At that time we had a caterpillar that ate nearly every leaf off our turnips; but it appeared that as soon as the caterpillar came up to the first row of Mr. Anderson's turnips on which he had put the salt and ashes, it stopped and did not go any farther. It looked as if the insect did not like the salt; whether it was the turnip absorbed the salt or not I do not know. For pears as well as peaches, and for all other kinds of fruit a high, dry position is the best. The land here is to a great extent rolling, and I find that it is just lost labour to plant any kind of fruit trees in those hollows. No kind of tree does well on a damp, cold bottom. Frosts occur on the hill on which I live.

D. CALDWELL.

[*Mr. D. Caldwell.*]

MR. J. G. MOWAT'S EVIDENCE.

J. GORDON MOWAT, of Galt, was called and examined.

CULTIVATION OF FIGS.

To Mr. Brown.—Fig trees are grown here. Some few years ago a man in Waterloo township grew a fig tree for four years, but it was killed. He covered it with straw—tied straw around the trunk—in winter; but before the tree came to bearing it was destroyed by mice. A year ago last spring several parties in the town, including myself, also commenced growing fig trees.

WINTER TREATMENT.

To protect the trees from the winter frost they are laid down about the 1st of November, in a trench—turned right over with the roots in the ground all the while, and then covered with earth They are planted erect, but on a ridge, and the roots are trained to one side across that ridge · and in the fall the tree is bent or laid right down in the trench, and covered, the branches being tied up against the trunk, with about five inches of earth, until the spring, when it is raised up again. So far trees treated in that way have flourished.

NO TROUBLE FROM SPRING FROSTS OR INSECTS.

There is no trouble from spring frosts, figs seem to stand them as well as quite a number of our more tender trees They have no insect enemy.

FALL HOAR FROSTS.

The trouble with the fig is that in the fall hoar frosts are apt to kill the leaves and prevent the new wood from ripening, and that wood dies off the following spring: but by covering the tree with paper or any other material in September or October, when the thermometer is below forty, the wood will sufficiently mature to stand the winter. The ripening of new wood would probably be hastened by pinching back.

MATURITY OF THE FIG.

I cannot say anything as to when the trees will yield fruit. In Michigan where they have tried the fig it bears in four years. The fig is grown in Massachusetts, and succeeds well. The covering there is about four inches of earth. In the neighbourhood of Washington it is about two inches of earth. In Ohio large crops have been gathered by the few parties who have grown figs—annual crops. The summer temperature during the whole season of vegetation is high enough here for the fruit to ripen. The fig plants are obtained from Washington. I believe they can be got in Rochester. I saw a sample of grapes grown last year by Mr. Fergus Anderson, of Blenheim, which were nearly an inch in diameter—a black grape, and I think of good flavour. There are in the county graperies of from about a quarter of an acre to about an acre in extent. I think that owing to the rarity of extremely low temperatures in that region the land along the shores of Lake Huron is about the best place in Ontario for fig culture.

J. GORDON MOWAT.

[*Mr. Mowat.*]

Sittings to take oral evidence, held at Almonte, October 18th, 1880. *Present*—Messrs. Byrne (Chairman) and Dymond.

MR. W. C. CALDWELL'S EVIDENCE.

Wm. C. Caldwell, M.P.P., of Lanark Village, was called and examined.

Forestry in Lanark.

I am a lumber merchant by trade. There is considerable standing timber in our district; ten miles back of us there is little settlement; the soil there is light and stony, with rock; the timber there is principally pine. The hardwoods are maple, beech, elm, basswood, some birch, and very little oak, and here and there a little hickory. There is some iron wood and butternut, also tamarack ash, and poplar. The hardwoods are still being destroyed for clearing and firewood We have very little second growth of timber The second growth is considered to be tougher wood, and better for manufacturing purposes, than the first.

Use of Hardwoods.

There is a demand for the hardwoods both locally and for shipment. Ash and basswood are shipped to Oswego; we can sell all we can get. The basswood is used for furniture, and for boxes in starch factories Good basswood will bring from $12 to $14 per thousand at Brockville and other shipping points in the front Culls bring $5 to $6 per 1000. The ash is about the same as the basswood, it is either black or white ash I speak of. The white ash is used for implements, there is not much of it Our soil is not a good one for basswood; it needs a heavy soil Hard maple is used for waggon axle-trees as well as several other purposes I had an order for some from Manitoba but could not supply it in time. Beech is used only for firewood We can sell some elm, but there is no foreign demand, there is a local demand. The black birch is used for furniture; the tamarack, if large, is used as square timber, and the smaller for railway ties; the cedar also is used for railway ties and shingles. We have no black walnut in the district. There is no demand for poplar or other soft woods. There has been no attempt to replant forest trees.

Necessity for Replanting

I have given some attention to forestry. I think the time has come when attention should be paid to tree planting. We have a great deal of broken rough land that is at present worthless, and that might be profitably planted. I think in the first place the useless soil would be utilized, in the next the value of the farms would be increased, then that the crops would be sheltered where they are now exposed, and lastly, in time the climate would become moister; it is now very dry.

Effects on Climate.

My experience is the climate has become much dryer in the last fifteen years and the streams have been much lower. I attribute this to the clearing of the land.

Trees to be Planted.

I would plant elm, maple, ash, and basswood, all fast growing trees, mingled with spruce and cedar as evergreens, as well as pine. I think an elm would be forty to fifty years in attaining to ten or twelve inches in diameter. The soil would have some effect on the growth, but I do not think either ash, maple or basswood would grow much faster than the elm. A maple eight inches in diameter might be tapped for sugar; I think it would then be twenty-five to thirty years old. I have not experience enough to speak positively on that point. Lombardy poplars twenty-two years old, measured by me, are from six feet to eight feet four inches in circumference. I do not recommend them for shade trees; they soon show a good deal of dead wood, and harbour insects. Either for

shade trees or ornamental purposes the trees I have named first are, in my opinion, the most desirable for planting. I think the Government, through the Agricultural Societies, might appropriate a portion of the annual grant to the encouragement of tree-planting.

Experience in Under-draining.

I have underdrained to some extent. I had a tamarack swamp of thirty acres of black muck, and very wet. After clearing and stumping we dug the drains three and a half feet deep and an acre apart; we used pine lumber. The main drain was composed of two-inch plank, eight inches by ten inches. The side drains were of one-inch lumber, also pine, and four-inch pipes. The effect was to turn a profitless swamp into a good field. We have grown oats, hay, barley, wheat, and roots on it. Our first crop of hay is usually two tons to the acre; wheat (spring) yielded twenty bushels to the acre, barley the same, and oats forty bushels. Roots did not do well; the tops were large, but the yield was not good.

Cost of Draining.

The draining costs 55 cents a rod. I paid 25 cents a rod for digging. and the lumber would be worth 15 cents a rod; the filling would cost 10 to 15 cents a rod; including side drains the cost of the whole work would be about $800, or $10 per acre. In a soil of that kind I think a wood drain answers best; it will last just as long as the soil is wet, as this is. On sandy soil the result would be different. I have used both sand and lime in improving the soil thus reclaimed. I have under-drained other higher lands with stone. We only drain just where it is needed by the state of the land.

Cattle for Market.

I have fed cattle for market. We buy young cattle at three to four years and feed from early in December to April. We give about 2 cents a pound live weight. They weigh from 900 to 1,100 pounds when put up. They are fed for five months; we give them roots, cut hay and straw, and hashed grain. They weigh from 1,050 to 1,400 pounds in the spring. They then average 4½ to 5 cents a pound. They are usually common cattle, with an occasional grade. There is not such a tendency as there should be to use improved males. I could give a better price, and make a better price, if the stock were improved. I think a tax should be put on all male stock, in order to encourage the use of thoroughbred males, both horses and cattle.

W. C. CALDWELL.

Sitting to take oral evidence, held at Arnprior, October 14th, 1880. *Present*—Messrs. E. Byrne (Chairman) and A. H. Dymond.

MR. USBORNE'S EVIDENCE.

John Usborne, of Arnprior, was called and examined.

Fruit Growing and Forestry in Renfrew.

To Mr. Dymond—I am manager of the Renfrew Fruit and Floral Company owning the Waba Nurseries at this place. The Company has existed and been in operation for three years. I have been experimenting in fruit raising altogether for six years. The object of the Company is to supply northern and eastern Canada and Manitoba with fruit and other trees and shrubs, suited to their climate and soil, in which those reared in a more temperate climate will not succeed. We cultivate both forest and fruit trees, shrubs, vines, and general nursery stock. Trees brought from other parts have generally failed. The varieties supplied have been too tender.

[*Mr. Usborne.*]

Experiments in Apple Culture.

Five years ago I imported ten of each of several different varieties of apple trees, and put them out in nursery rows to see how they would stand the winter. They were put out in the spring. The following spring some varieties were all alive, and all the rest died. Thirteen varieties out of fifty lived. These were the Red Astrachan, White Astrachan, Tetofsky, Sops of Wine, Duchess of Oldenburg, Fameuse, Keswick Codlin, Twenty Ounce, English Russet, Pomme Grise, Peach Apple, Tollman's Sweeting, and the Wallbridge. We propagated these pretty largely. I have since discarded the Keswick Codlin, Sops of Wine, and Tollman, as apples subject to be winter killed. They don't die, but are killed back.

Successful Hardy Varieties.

Out of all the sorts the only varieties never injured are the White Astrachan, Tetofsky, the Duchess of Oldenburg, and the Peach Apple. We have thus established the fact that these are the sorts that will stand this climate. These four sorts have never suffered. These will in future be propagated largely. Crabs all do well. We have fruited the Tetofsky, a sweet summer apple of a small size. The Duchess with us ripens early in September. The White Astrachan we have not fruited sufficiently to say anything of. The Peach Apple we have not fruited. The fruit of the Duchess and the Tetofsky has been very fine, so that both in the character of the fruit, and in hardiness, these trees fully sustain their reputation.

Acclimatizing Trees—Seedlings.

Trees grown in the colder climate, we consider, will be hardier than those imported. We are growing twenty-six different varieties of apples from seedlings in the county. The original trees are all fine fruits. Time has not yet allowed of our fully testing the respective merits for keeping or otherwise.

Russian Apples.

We have now also some ten varieties of Russian apples on trial; they are not yet fruited. We have shipped trees to Manitoba. We adopt no means for protecting the apple trees in winter; our nurseries are not protected by wind-breaks.

Preferable Aspects.

We find the apple trees do best exposed to the north, and where the snow lies deep, with no sun. In a sheltered, warm spot, the March sun starts the sap too early, and the bark splits on the south side from frosts, and the tree is killed. Our soil is a sandy loam; we have no heavy soil. It is not under-drained at all.

Pear Trees.

We are propagating pear trees that have so far done well. They are the Flemish Beauty and Onondaga, and also a pear grown in the district, the origin of which is unknown. It is a juicy, sweet pear, green colour, and of fair size. I only know of one original tree; it is at Fitzroy Harbour.

Plum Culture.

We have grown and fruited Coe's Golden Drop plum, the Lombard, Yellow Magnum Bonum, the Green Gage, and the Fellenberg. They have all done well. These are all imported trees. We have had them six years, and have propagated from them. We

imported from Chateaurichie in Quebec, a little plum known as the Quebec Plum, which succeeds well. We have budded 20,000 plum trees this year. We have about 180,000 apple trees of all sizes in the nursery.

Cherries so far a Failure.

We have failed so far with cherries. The Morillos are nearly all that do at all. We are now trying some Quebec varieties not yet fruited, but growing. We have good reports of the majority of our fruit trees. Ours is the most northerly nursery in Canada I know of.

Grape Growing.

We grow grapes largely. We have fruited this year some thirty varieties. Among others the Delaware, and Champion are early grapes; Rogers' Nos. 33 and 19, the Martha, the Walter, the Concord, and the Telegraph, are useful varieties. I would not recommend the Clinton. We grow forty-one varieties altogether, chiefly with a view to fruit, thirty-five of which we have ripened successfully this year. We have made some good wine—champagne, and some light dry wines.

Treatment in Winter—Curculio.

We have to lay the vines down in the winter and keep them covered with soil to protect them from the spring suns. We already suffer from the curculio on the plum; we adopt jarring as a means of checking them.

Strawberries and Raspberries.—Currants.

We grow the Wilson's Albany strawberry exclusively, and it does well. There is no sale for raspberries or the vines. We grow gooseberries. The Crown Bob does best with us. We grow the American Seedling, Houghton, and Downey, but we prefer the Crown Bob. It is a large fruit, and escapes mildew. In currants we prefer the Red Cherry and White Grape varieties.

Forest Tree Seeds.

We have sown a large quantity of seeds of forest trees—elm, maple, ash and cedar. We grow them to work our ornamental trees and to sell wholesale to the trade. There is no difficulty in raising these trees. We have about fifty-five acres under cultivation, and expect to extend it. The capital of the Company is $25,000. We have received a fair measure of encouragement so far. People have been so much deceived and disappointed in the past that it takes time to induce them to make new ventures. I attach more importance to the culture of grapes than any other fruit; the crop is certain and large. We have now 2,800 vines planted out, and many bearing.

JOHN USBORNE.

MR. HINMAN'S EVIDENCE.

Sittings to take oral evidence, held at Cobourg, October 19th, 1880. *Present*—Messrs. Aylsworth (Chairman) and Dymond.

Platt Hinman, of the Township of Haldimand, was called and examined.

Fruit Culture in Northumberland.

He said:—I am engaged in fruit culture which I carry on in conjunction with general farming. I have a farm of 800 acres, mostly cleared, and about 20 acres of which is an orchard. The greater portion of my orchard consists of apples, though I have

some plums. Peaches have never succeeded with me, though some of my neighbours have grown them to a limited extent. About one half of the fruit trees in the district are in full bearing.

Apple Growing.

Apple trees begin to bear plentifully in about ten years. About one hundred barrels for every one hundred acres is the quantity of fruit grown in the district.

Seedling Apples.

There are some seedling apples on my farm which have been there over eighty years, and while those which my grandfather grafted had mostly died, those which were left in their natural state survived, and still bear freely; they have no local name.

Soil—Protection—Planting.

A heavy soil, well drained, is the best for apples, and it is all the better if limestone is present. Orchards should be protected by patches of shrubbery, and the trees should be planted 30 feet apart.

Hardy Varieties—Good Shippers.

I can hardly say what varieties of apples are best for the district, as I have not given them all a fair trial. The Rhode Island Greening and the Spitzenberg have proved to be the hardiest varieties in the older orchards, though we have better shipping apples, such as the King of Tompkins County and the Holland Pippin. The Northern Spy is one of our best varieties for general purposes. The fruit of the Baldwin is good, but the tree does not stand the climate very well. It, and the Northern Spy, are most in demand for shipping.

Summer Varieties—Prices for Summer and Winter Apples.

The best summer varieties are the Early Harvest, the Red Astrachan, the Sweet Bow and the Golden sweet. The average price for summer apples for three or four years back has been from $1 to $1.25; at present there are men in my orchard picking the best winter apples they can get for sixty cents per barrel. They find their own barrels, but I board the men while they are picking. These apples are for shipment to Europe. For the first time in our district the supply of apples of all kinds is largely in excess of the demand.

A Drying Machine—Process.

I and some others have purchased a drying machine which will dry twenty or thirty bushels of fruit per day. We bought it with the intention of drying apples and exporting them to the North-West. The apples are first bleached white by the fumes of sulphur. The process was at one time a sort of secret in the United States, but it is now well known. It is similiar to the one which I have seen described in evidence previously taken by the Commission.

Prices for Dried Apples—Utilizing all Sorts.

We can get one bushel of dried apples, or 22 pounds, from 4 or 4½ bushels of green ones. The usual price of dried apples is 7 cents per pound; but at present they are only 5 cents. We purpose sending them where they will command readily about 20 cents per pound. At present there are waggon loads of apples of certain varieties rotting on the fields, as we can not sell them. Any kind of sound apples can be utilized by the drying machine.

[*Mr. Hinman.*]

Blight—Borers—Codlin Worm—Caterpillars.

Apple trees in the district are not subject to blight and the borers are not very destructive. The codlin worm is, however, very prevalent in the fruit. There is not much trouble with the tent caterpillars.

Cultivation of Orchards.

I am in favour of cultivating orchards for at least the first ten years, but there is sometimes a danger that over-cultivation might make the trees too tender. After the first ten years I seed down and mulch about the trees.

Pear Culture—Prices—Blight.

I cultivate pears to a considerable extent, and they are as successful as apples, if planted on heavy land. The average price realized per barrel for the best pears is $4. They are not so profitable as apples. The blight has not attacked the trees to any serious extent for some years back, and they are not liable to insect pests.

Plum Growing—Varieties—Prices—The Curculio.

Plums are cultivated in the district, and do best on a light lively soil made rich. The large blue plum is esteemed for home consumption. The yellow egg plum is more subject to the curculio than the blue Pond's seedling. The McLaughlin and the Washington are also cultivated. There are more Damsons shipped than any other variety. They are prolific bearers, and are pretty free from the curculio. Plums sell now at $2 per bushel, and their cultivation is increasing. The curculio has interefered with the cultivation and production of the largest and best varieties.

Salt a Preventive of Black Knot—Birds.

Some years ago plum trees were subject to the black knot, but we find that the use of salt prevents it from spreading. I put four or five quarts under each tree. The birds do not injure the ripening plums to any extent. It is supposed that the black knot is produced by a fly, and that the best way to prevent the knot is to kill the fly.

Peaches—Cherries.

Peach trees sometimes get so far as to bloom, but they rarely if ever fruit in this district. We only raise cherries enough for home consumption. A few years ago the plum-slug killed the black and red cherries almost wholly. We are now planting the English cherry and a small black one called the Black Eagle, which I think succeeds best.

Grape Culture.

Almost every farmer has a few grape vines for his own consumption. I have about twenty vines in bearing and I think the crop pays well if properly attended to. I grow the Rogers' No. 15, the Delaware, the Concord, and a few others. I get the best returns from the Concord. The vines should be planted at least twelve feet apart each way and supported on trellises. I trim my vines in the fall and lay them down for the winter; covering them with a little brush or any thing of that kind. Fifty pounds of grapes from each vine is my largest yield.

Small Fruits.

I grow most of the small fruits for home consumption, but both currants and gooseberries suffer from the attacks of the worm. Hellebore is not much used, the reason

[*Mr. Hinman.*]

being that the fruit is neglected so much that people are afraid to apply a poisonous remedy. I grow the English gooseberries such as the White Smith very successfully.

ARBORICULTURE—SALT AS A FERTILIZER—LAND PLASTER—ASHES.

Trees are being planted to some extent for the protection of orchards, and for ornamental purposes. I apply salt to my land, especially for barley, as it stiffens and brightens the straw. I also use land plaster, but prefer ashes to either of them if I could get them in sufficient quantities. Salt, however, is a great help to light land in a dry season. I would use land plaster on grasses and roots.

PURE-BRED DURHAMS.

I keep a few pure-bred Durhams for breeding purposes. There is a constant demand for well-bred cattle. For dairy purposes I would mix a little Ayrshire, but for stock purposes the Durhams are the best, they are very good milkers and the best for beef. Of sheep I prefer the cross between a Cotswold ram and Leicester ewes as giving a large carcass, and a large quantity of wool.

PLATT HINMAN.

MR. CHAPLIN'S EVIDENCE.

Sittings to take oral evidence, held at Bowmanville, October 20th, 1880. *Present*—Messrs. DRYDEN (Chairman), AYLSWORTH, and DYMOND.

W. H. CHAPLIN, of the Village of Newcastle, was called and examined.

FRUIT TREE GROWING.

He said:—I am a nurseryman rather than a fruit grower, and raise fruit and ornamental trees. I ship quite a number of trees outside of my own immediate district.

INCREASED ORCHARD CULTIVATION.

The quantity of apples grown in the district is increasing, and people are setting out new orchards. Winter apples are mostly planted now.

VARIETIES OF SUMMER AND FALL APPLES.

Of summer apples I would recommend the Early Harvest and the Red Astrachan as being most profitable to the farmer. Of fall apples the St. Lawrence, the Fall Jenneting, the Holland Pippin, the Snow Apple; and the Duchess of Oldenburg, which is one of the best.

WINTER VARIETIES.

Of winter apples I recommend the Northern Spy, the Baldwin, the Greening, and the Golden Russet. Taking the Northern Spy all in all, it is the best tree we have, notwithstanding its being so long in coming to maturity.

MANURE—CULTIVATION OF YOUNG ORCHARDS.

I use common barn-yard manure. I would cultivate a young orchard at least six or seven years, until some of the trees were coming into bearing, and soon after that it is better to keep on cultivating. Apple trees should be planted thirty feet apart each way, and a sandy loam, with a clay subsoil, is the best for them.

[*Mr. Chaplin.*]

Drainage—Apples for Export.

Orchards should be drained, especially if the land is cold at the bottom. The Ribston Pippen, the Northern Spy, the Baldwin, and the Russet are the best for exportation.

Pear Culture—Market Prices.

Some varieties of pears succeed well in this district, such as the Flemish Beauty, the Bartlett, the Louise Bonne de Jersey, the Duchess, the Oswego Beurre, and the Winter Nelis. Pears are shipped to Montreal for the Canadian market. The Bartlett was worth from $12 to $18 per barrel during the Montreal fair; afterwards they were sold at from $5 to $6.

Price of Apples.

Apples sell lower this year than usual, bringing only from $1 to $1.25, the buyers picking them and supplying the barrels. Fruit drying or canning is not carried on in the district to any extent.

Grape Cultivation.

People are planting grape vines for amateur growth.

A Large Pear Orchard—Plums—Peaches.

One gentleman, Mr. Beaman, west of Newcastle, has a pear orchard of over 1,900 trees. Pear trees suffer a good deal through the blight. I am not able to trace the cause. Plums are not very largely grown. The Lombard is considered the best for general purposes. A few peaches are grown by amateurs, but none for sale.

Small Fruits.

We grow all the small fruits. Strawberries and gooseberries do well. Of the latter, Smith's Improved and the Downing are the favourites. These are not subject to mildew, but the English varieties are, including the White Smith.

Destructive Birds.

The robin and cedar bird are very destructive to the cherry, and the woodpecker is also troublesome.

Tree Planting.

Farmers do not generally appreciate the importance of replanting their farms with forest trees. For protecting fall wheat, etc., I would plant the white pine, the Norway spruce, and our native pine, which last is one of the best. The Austrian pine is also good. These trees should not be planted less than from three to five feet high, and in four or five years they will attain a length of from about three to four yards.

Protection to Orchards.

I recommend the planting of trees around orchards, and, if exposed to high winds I would plant them in belts. On account of the hot sunny days in early spring, when the buds are liable to open too soon, I prefer a westerly or north-westerly aspect. Grape vines I would plant on a southerly slope.

[*Mr. Chaplin.*]

Treatment of Vines.

I prune my vines in the fall. Some varieties are laid down in winter, and some are not.

Pruning Apple Trees.

I would prune apple trees in spring, just as soon as the heavy frosts have left, say, in March or April. When scions are cut during the fall, I notice that the stump deadens in the winter, which is not the case if the cutting is done in the spring.

W. H. CHAPLIN.

MR. ROY'S EVIDENCE.

William Roy, Township of Sarawak (Owen Sound P.O.), called and examined.

Fruit Culture at Owen Sound.

I have been paying particular attention to fruit culture since I went to Owen Sound eighteen years ago. I have an orchard of about 200 apple trees. I am somewhat familiar with the fruit growing capacity of the district in which I live. I have been Vice-President of the Fruit Growers' Association of Ontario for two years, and I represent at the present time District number 10, comprising the counties of Grey, Bruce, and Huron, on the Board of the Agriculture and Arts Association.

Apples of the District.

The apples grown most largely in my district for export are the Northern Spy, Rhode Island Greening, Golden Russet, Pomme Gris, and Belleflower. These are all good winter apples. The fewer varieties of apples that are grown for export the better, provided they are a good kind.

Other Fruits.

The other kinds of fruit I grow are pears; a few peaches; plums to a large extent quinces to a small extent. Of small fruit we grow strawberries and raspberries largely and gooseberries succeed very well.

The Best Fruit Growing Section

Almost every description of fruit succeeds well in our district. I regard it as the very best fruit growing section. I refer to the district from Sarnia to Collingwood, along the shore of Lake Huron and the Georgian Bay.

Best Apples for Export.

149 For export I would recommend the following apples: Spitzenberg, Golden Russet, Holland Pippin, Newtown Pippin, Pomme Grise, Baldwin, Northern Spy, Bellflower, Rhode Island Greening. These are all winter fruit, and winter fruit is the most profitable.

Summer Apples Not Profitable.

We grow summer apples for local consumption. I grow the Astrachan, Keswick Codlin, and Early Harvest. There is such a variety of fall apples that I don't know what ones to recommend. Summer apples don't sell well. I think people grow too

many of them, and they are not profitable, as they come in just when other fruits are ripe. I would not recommend any one to plant many autumn apples.

Market for Winter Apples—Prices.

Winter apples can be sold in the spring up to June. I should say the proportion of winter apples shipped is about one-half of the whole amount grown, the other half being used for local consumption. The average price realized per barrel is from $1.50 to $1.75.

Local Seedlings.

There have been a few seedling apples cultivated in our neigbbourhood, but none of them have been recommended by the Fruit Growers' Association as yet. They are yet on trial. I couldn't mention them by name, as they have not a name so far. Some have given them a local name of their own, but they have not yet an official name.

Climate—Hardiness—Insects.

I don't think that any of the standard varieties have proved too tender for our district. We thought at one time the Baldwin was tender, but now as soon as it is grown up and seven or eight years old, I find it to be very hardy and to bear very good fruit. Apples with us are somewhat subject to borers, but they are not very destructive to them. We have not had any caterpillars this year.

Easy Destruction of Caterpillars.

Two or three years ago the tent caterpillar did great mischief. The remedy against them is to go over the trees in winter; walk along on the crust of the snow and examine the trees, and you will readily detect the rings of eggs. They should be taken off in the winter and put in the fire. I have done so in my orchard invariably. Any man who does this will keep his orchard free from caterpillars, that is, provided his neighbours do the same.

Cultivation of Orchards.

I prefer to cultivate the ground of the orchard until the trees are seven or eight years of age, and then you may seed it down. After trees have reached that age I would not do much at cultivation. I don't see how you can cultivate after the trees are eight years old as they begin to grow close together. I planted my trees eighteen years ago thirty feet apart, and they are always meeting. It is almost impossible to cultivate when trees meet.

Surplus Apples fed to Animals.

I think it would be unprofitable to grow apples when they must be sold under a dollar a barrel. Surplus apples are usually fed to the animals. That is the case this year. I think one-third of the fall apples this year have been fed to the animals. I don't think that is the most profitable way they could be disposed of, but at present you can't do anything else with them. You can't sell them. We have not got into the making of cider, but I suppose it will come round.

The Drying Process.

We have not adopted any process of drying them except what is done in the houses. I am not acquainted with the new method of drying apples by evaporation, but I am acquainted with the principles. I don't see any reason why fall and summer apples should not be utilized in this drying process. The process is inexpensive, and I think it would pay to dry them. A man with children could employ them in that way. A good many people don't appreciate the value of apples, because the price of them is so very low that it doesn't pay to trouble with them.

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Large Shipments of Winter Apples.

In the Georgian Bay district I think there must have been from 3,000 to 4,000 barrels shipped from Owen Sound alone this year. I couldn't say where these have been shipped to. They all were the winter kinds I have mentioned. I shipped some of the Bellefleur to Scotland, and they succeeded very well. I got $3 a barrel for them here before they were shipped. They were all hand picked. I think they would fetch $6 or $7 on the other side.

How to Ship Apples.

I think the best way to ship apples, if you can go into it extensively, is to put a piece of silk paper round each apple. I would advise that they be packed just as they are taken off the trees. I think it would be as well to put them in the barrel at once. We press them. I think it is better to press them than to adopt any system of bran or grain packing.

Preserving Apples in Winter.

I have heard that putting apples in pits would save them; they come out in the spring of the year very fine, but if you don't dispose of them at once after taking them out of the pit they will spoil very soon.

Pears—Standards—Dwarfs.

There is a considerable quantity of pears grown in our district. The standard pear is a curious tree. Sometimes it produces at eight or nine years, sometimes not till fifteen years. If you go into dwarf trees you may depend on them in four or five years.

Most Esteemed Varieties.

There is such a variety of pears that I could hardly say which are the most esteemed. The Superfine is one of the best pears, and the Bartlett is always a very profitable pear. It comes in very early, and is easily sold. There is a new pear, Clapp's Favourite, which is as early as the Bartlett, has a rich flavour, and always sells well. The Beurre d'Anjou, Duchesse d'Angouleme, and Winter Nelis are are also esteemed highly. The Beurre Deihl is a pear that will keep till the end of December. Among other very good varieties of pears are the Sheldon and Flemish Beauty.

Market—Ripening—Prices.

The crop is not consumed very much in the neighbourhood, but is generally shipped, a considerable quantity going to Chicago. The pear is a peculiar fruit in regard to its ripening Some varieties will ripen much more quickly than others after they are pulled from the trees. About $2 is the average price realized per bushel.

Blight—Remedies.

Two or three years ago the pear trees in our locality were subjected to the blight, but last year I saw none of it either on my own place or elsewhere. I don't think I know of any remedy for it. It is good to put linseed on the trunk of the tree and on the branches, but I have tried that, and have nevertheless seen the tree attacked by the blight. The only way I find is to cut the blighted part down. Neither the fruit nor the trees are subject to borers.

Insects—Slugs—Hellebore.

I have seen few insects this year that are destructive to the leaves. Some years ago we used to be troubled with the black slug on the leaves, but it seems to have disappeared

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now. I have used hellebore and wood ashes, but one of the best things I found was dry earth, or air-slacked lime.—Sprinkle the tree with dry earth or lime, and the slugs fall off. This treatment appears to have banished them.

Best Soil for Pears.

For growing pears I prefer the soil to be a clay loam. Our region of the country is a clay loam resting on a limestone rock. I was in the habit of manuring pretty heavily for pears; but I thought that the manure, especially as it was old and not fresh, made the fruit grow too fast, so that it did not ripen in the fall.

Wood-Ashes—Cultivation—Exportation.

I have given up manuring almost entirely, but I use wood-ashes instead. I cultivate in the orchard to keep down weeds. I doubt if anything can be done in the exporting of pears to England. You can only depend on shipping one or two varieties, but such a pear as the Flemish Beauty you could not ship at all. I dont think the export trade in pears will attain any great proportions, because they won't keep.

Pear Culture Profitable.

I don't think I ever saw finer pears in any country than I have seen in Canada. I think pear culture can be carried on as profitably as that of apples around the city. I have sold pears for as high as $8 a bushel.

A Plum District.

We grow plums to a very large extent in our district, and profitably. They are grown in great varieties.

Large Orchards—Heavy Shipments.

Perhaps for two years past some of my neighbours have planted some thousands of plum trees, from 500 to 1,000 trees in some cases. It is becoming to be a trade of large dimensions. This summer in Owen Sound I have seen them ship as many as 2,000 bushels in a day. 14,000 or 16,000 bushels must have been shipped from the district of Owen Sound this year.

Desirable Varieties.

The Lombard and Pond's Seedling are very good plums for shipping. One of our best plums is the Coe's Golden Drop, which is always saleable. Fellenberg is a prune plum which is very good. It can be eaten either fresh or dried. It is a sweet, nice plum, and opens very easily. I would advise the Victoria to be planted very largely, as it is very good for exportation. There are various other plums, such as the McLaughlan, Washington, Yellow Egg, General Hand, Reine Claude de Bavay, but they must be eaten very shortly after they are pulled. The Diamond is also one of the best for exporting.

The Curculio not Arrived Yet.

We are not troubled with the curculio in our plums. It hasn't made its appearance in our district. I don't know what to attribute its absence to. All our soil is impregnated with lime. I heard it had appeared in Goderich and also in Kincardine, but the report of its being in the latter place is not correct, as I have made inquiries and ascertained to the contrary.

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Prices—Packing for Shipment

The average price of plums for a number of years has been about a dollar a bushel. This year they were about ninety cents a bushel. Nearly all the plums I have mentioned as having been exported from Owen Sound went to Chicago. There is no particular method of packing plums for exportation except to pick out the spoiled ones, and even this cannot be done thoroughly as it takes up too much time.

Prune Plums.

There are very few prune plums grown in our district, but those who do grow them usually have them dried. If they dried these prune plums under the same process as the French plums they would look as well. The Fellenberg eats better than any prune I have ever seen. The prunes of commerce are laid over with sugar, which makes them sweet, but in the Fellenberg no sugar is required, and they are very sweet after being dried. This plum has been recommended by the Fruit Grower's Association, and its growth is increasing. I was the only exhibitor of this plum for some years, but now you find it planted here and there. It might be grown to a large extent, and at a profit.

Plum Rot—Seedlings—Birds.

This is the only year I have had plums suffer from the rot. I think all varieties of plums are subject to the rot, except the Fellenberg I have mentioned. I don't know of any seedling plums in my neighbourhood. I have tried some seedlings myself, but none have turned out well. Birds do not injure the plums to any extent.

Use of Ashes—Salt.

I use ashes for the trees sometimes, and sometimes throw a little salt around them. I salt quince trees pretty heavily. I speak of unleached ashes. I think they have a fertilizing effect. Ashes are a preservative against borers. Unleeched ashes might prove too strong if you used too much.

Peach Growing—Frost an Impediment.

I raised some peaches, but have not succeeded very well. They are raised in our district, and pretty good here and there. Where they have succeeded the trees have stood the winter. The early Crawford trees, I think stand the winter the best. The local demand consumes the whole crop of our peaches. In fact, we import them for our own use. I don't think I could grow peaches because the frost comes on in the fall before they thoroughly ripen. My farm is on the Bay shore.

Apricots—Cherries—Quinces.

I have no apricots. Cherries are grown to a small extent with us, and the crop is all consumed at home. The May Dukes succeed very well. Cherries are only sold to a very small extent. I have raised a few very good quinces. They are grown successfully in our district by those who cultivate them properly. The Apple quince and Portugal quince succeed the best. They bear regular crops. There is very little demand for the fruit, and what is grown is usually made into preserves or used to flavour preserves.

Strawberry Cultivation.

Strawberries are cultivated in our district to a large extent. The varieties most esteemed are Wilson's Albany, and Triomphe de Gand. The Sharpless is a fine strawberry.

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The Wilson is the most profitable for the market. I couldn't say what would be the average product of an acre, as I have never cultivated as much as an acre. The usual price is from eight to ten cents per quart.

Robins—Insects—Manure.

Robins are destructive to strawberries. There are no injurious insects that seriously attack the crop. Strawberries require a very highly manured soil. The plants remain good for three years at the most. They should be kept no longer than three years. I would say renew after three years.

Raspberries—Varieties.

Q. What varieties of raspberries are successfully grown in your district?—A. I think the Philadelphia is the most profitable. It sells the best. Brinkel's Orange is very fine, but tender. The average price realized per quart is about ten cents. There are no insects very injurious to the raspberry. There is a bug comes on when the berry is nearly ripe and destroys a good deal of them. There are not many raspberries cultivated; there are not half enough cultivated. Their cultivation might be increased a thousand fold and there would still be a sale for them. I consider it a better berry to use on the table than the strawberry. It is a safe berry to grow unless there is a severe winter, when the canes are apt to be killed, especially the white canes. We could cultivate an outside market for our berries; at present our home market takes up all we can grow. I don't think an outside market is required yet, as I believe this city would take all the cultivated raspberries that are grown in Ontario.

Wild Raspberries.

The wild raspberry is grown to an enormous extent, and around our region of country thousands of bushels were exported some twelve or fifteen years ago; in fact all the Indians brought in enormous quantities of berries which were either made into raspberry vinegar or exported; but now there is not one wild bush around the Peninsula for a thousand some years ago, and hence there is a great necessity for growing cultivated raspberries. For making vinegar wild raspberries are fully better than the cultivated ones.

Mode of Cultivating Raspberries.

I grow my raspberries in hills eight feet apart, but I would advise them to be ten feet apart. They should be hoed, manured, and cultivated well. In each hill there should be four or six canes, and if you grow them to any extent you should run the cultivator through to keep down the suckers, and all useless canes, except the ones you intend for next year's fruit.

Treatment of the Canes—Planting.

Leave only the strong healthy new ones; I think it is a good thing to keep them about six feet high. Don't let them come up as high as eight or ten feet. You will have a better crop by keeping them lower. I don't protect them at all in the winter, but some of the tender ones such as Brinckle's Orange I have laid down under the snow, that is, laid them down and let the snow come over them. I have my raspberries eight feet apart each way. I plant them that distance apart for the purpose of being able to run the cultivator through them.

Grape Culture—Best Sorts.

Grapes are grown largely with us but all by amateurs. There are no vineyards for commercial purposes. The grapes that do best with me are Rogers' No. 3, Massasoit,

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Agawam, Nos. 15 and 19, Salem No. 22, Clinton, and Concord. These are all I would recommend. I have about fifty vines and twenty-three varieties. I would only recommend the ones I have spoken of for my region of the country. The best soil for grapes is a light gravelly soil, well drained. The trouble I have with mine is that the land is too heavy, too strong. The vine grows too much to wood.

Wine Making.

Some of the varieties I have mentioned would be adapted for wine making. I make wine by mixing them all together. I agree with Mr. Hoskin in what he said about wine making. I always understood that Concord was a good grape to make wine. From my own experience I can't say whether it is or not, for I have put it in with the others and I have not made wine from it separately. All the wine I make is for family use, perhaps from 20 to 30 gallons. I have wine now that was made in 1875, and it is very fine wine indeed. I put no spirits or alcohol or anything, but two pounds of sugar to the gallon. I put in more sugar than I suppose I should have done, but some of the grapes did not ripen thoroughly, and I thought some more sugar would make them better. Such wine will keep itself, without any spirits whatever, and the older it is, I think, the better. My mode of making wine is just about the same as Mr. Hoskin's, only I squeeze the grapes more. I beat them a little besides squeezing them. It is better not to crush the seed nor the shank.

Management of Vines.

I train my vines on posts and wires, plant them ten feet apart, and allow four canes to grow from each vine. For two or three years I followed the renewal system of cutting out the vines that bore this year and allowing the new vines to grow up for next year's fruit. I found that system did not succeed very well, and I tried the spur system, that is to allow the vines to be four or five years old, and each spur to grow out of it four or five inches long. In the pruning time, sometimes in November, sometimes in spring, I leave four or five spurs of new wood, and the fruit comes out on these spurs. I think it is much better than the renewal system. I think the cultivation of the grape could be carried on to a much larger extent than it now is in our district, and profitably. The vines are not injured by disease in the leaf or root.

The Phylloxera.

I never heard till the other day that the Phylloxera was in Canada. I don't believe it is in Canada. Mr. Arnold, at a meeting of the Fruit Growers' Association, held in Hamilton lately, said it was in this country, but I don't think the insect he says is the phylloxera, is the phylloxera.

Robins—Cherry Birds.

I find robins are destructive to grapes, raspberries and strawberries. The cherry bird is nearly as bad, but he doesn't come in such flocks. I have no knowledge of the habits of the robin, but I don't think he has sufficient good qualities to compensate for his evil ones.

Habits of the Wood-Pecker.

I should like to make a remark about a species of wood-pecker. Mr. William Saunders and his son gave evidence that the wood-pecker does not suck the sap from the tree. I am thoroughly convinced that the bird he refers to is a sap-sucker, and I am also convinced that it is the sap-sucker that destroys a great many of our trees. I have watched them for hours, and I am sure of it. I think the wood-pecker is an enemy rather than a friend to the tree grower. I have Norway spruce and lilacs that have been destroyed by these sap-suckers. Austrian pine and Scotch pine have been regularly skinned by them. They take off the bark, suck off the sap, and the tree finally dies.

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Protection of Birds.

I think the protection of birds is of much importance with regard to fruit growing. I have seen birds alight on a rose bush and clear it of all the insects on it. I am not sufficiently acquainted with their habits to express my opinion whether birds eat beneficial as well as injurious insects indiscriminately. As for the robin I don't think he eats insects to a great extent. He eats cut-worms; I have never seen him eat insects.

Black Caps.

My black-caps succeed very well. I have some very fine bushes. The canes don't suffer from winter-killing. They bear regular crops. This black-cap is a raspberry. There is a black-cap of the bramble species. The Kittatiny and Early Wilson are very fine varieties. Blackberries would bring 15 cents a quart. I don't know of any insects that are seriously injurious to the blackberry. They require to be well cultivated in a strong soil.

Currants.

I cultivate currants to a small extent, and only for family use. The variety most esteemed with us is the black, white grape, Victoria red, Naples. There is no market for them, and I don't think their culture is profitable, beyond what is necessary for the family.

Gooseberries—Mildew.

I have tried the cultivation of gooseberries, but I haven't succeeded. They are not grown about Owen Sound to any extent. The great trouble with them is that they mildew. I have imported them from Scotland, some of the very best kind, but they don't succeed. The White Smith and other varieties have not succeeded. That is the experience of nearly every one in our neighbourhood. I don't know any part of Ontario where gooseberries do well. I doubt if there is any place in Ontario where they grow like they do in Scotland. I think the season here is too hot for them to thrive.

Cranberries—Melons.

Cranberries are not cultivated in our district. We cultivate melons for home consumption only. I don't think there were any grown for anything else about Owen Sound.

The Original Timber Cleared

In our district the country has not been cleared to a large extent of its original timber. Where the timber is gone I advise people to plant shade and ornamental trees.

Wind Breaks for Orchards.

In the case of orchards I think trees should be planted for wind breaks. For this purpose I would recommend our own black spruce, cedar, Norway spruce, Austrian pine, and Scotch pine. Besides these five evergreens may be mentioned the hemlock, which is a very beautiful tree. The Austrian pine has done well. It grows about as fast as the Scotch pine. I planted two some fifteen years ago, an Austrian and a Scotch pine, and the one is about as high as the other. I am not aware of any use the wood may be put to.

Growing Scotch Pines.

I am successful in growing Scotch pines. I got 3,000 young trees from Dundee in Scotland, including Scotch pine, Austrian pine and Norway pine. They nearly all suc-

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ceeded. To make sure of them they should be reset every two years until they are five years old, and after you reset them the last time they will do as much in two years as they would have done in five if you had not reset them at all. I recommend transplanting them till they are about five years old.

European Larch.

I have tried the European larch, which is much more pendulous. I have had no difficulty in establishing it here. It is a most beautiful and ornamental tree. I obtain it from Scotland. Our own forest trees are, of course, very beautiful.

Every Farmer Should Plant Trees.

Every farmer in the settled part of Ontario, where you will find almost all the trees taken away, should plant them on his farm as a shade for his crops and animals. I think it is high time forest trees should be planted about our farms. I have introduced no other foreign trees but what I have mentioned. I have introduced no foreign trees from the States.

Preserve the Original Bush.

When I cleared the place I kept a belt of original trees, and it has proved not only a great ornament, but a very great shelter for the orchard at all seasons of the year, and I would advise everyone to keep some of the original trees about their place. My forest trees are from 40 to 100 feet high. I keep this belt without cultivation. When people come to my place they remark about this fine looking belt of trees. It has all the appearance of an artificial wood.

Second Growth Timber.

I don't think there is anything in my district to hinder the second growth of timber. I think it might be done as well as in any other part of Ontario. If a forest of hardwood trees of this country is burned out or taken out you will find a growth of pine or hemlock follow it. I would advise the taking of our own forest bush trees and resetting them around the farm.

Cattle—Sheep—Seedlings.

I am not favourable to letting cattle get around shade trees. I don't think sheep could do any harm to a tree when it is five or six inches in diameter. I have not sown the seed of any tree but the horse chestnut, and black walnut. I have not made a practice of collecting seedlings from the bush, but they would succeed very well.

Hemlock Hedges.

A good Hemlock hedge can be got by taking young hemlocks from the bush and replanting them two or three times, I have tried to make a hemlock hedge from hemlocks three or four feet high. It proved no good, however, for they all died. The younger you get the hemlocks the better.

Value of Oak.

I sold a farm of which the bush was largely composed of oak. I suppose there was about 50 acres of oak. I am told that the white oak from this place actually paid the whole price of the 250 acres. I have often counted 70 or 80 rings on the oaks. That is on oaks of the original bush. I merely mention this to show what the value of oak is.

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Hard Woods of the District

Of hard woods around Owen Sound there are beech, maple and ash. We have no oak immediately around Owen Sound and no walnut. They are taking out hardwood now instead of pine, and using it for house flooring and such purposes. Basswood is not considered a hard wood. Every log of it that can be taken out can be sold. The supply is not sufficient for the demand. The reason the white oak became so valuable was that cabinet-makers began to make furniture of it, and of course that raised its value. The scarcity of black walnut has, of course, a favourable effect in raising the value of some of the other woods.

Growth of Black Walnut.

There is an idea that black walnut will not grow as far north as Owen Sound. Ten years ago I planted black walnut seeds, and at the present time two or three of the trees bear nuts. They are not only ornamental, but becoming to be a very useful tree. The diameter of two or three of them now will be as much as six inches. They were planted in a strong soil.

Seedling Apples.

I have seedling apples planted nine years ago, but only about half of them have borne any fruit as yet. I think some of them have true merit, but I cannot say distinctly yet.

Benefit of Planting Trees—Transplanting.

It is not easy to give a plan to encourage a man to lay out his time and means in planting trees, the benefit of which he can only reap thirty years hence; but still the fact is there that a benefit would be reaped by some one. In transplanting trees the smaller the better. If you get a tree four or five feet high you may replant it, but my experience is that the sooner you begin to transplant the trees the better. I usually transplant fruit and other trees in the fall. The strongest and almost only reason I have for transplanting them then is that I have more time to do the work then.

Cultivation of Trees.

I think it is a good thing to cultivate around a tree. I don't think it is good to cultivate around a peach tree in a rich soil, because the tree gets too much wood in the fall, and the frost comes on and kills it before the wood hardens. As regards forest trees, I think they would succeed better for a few years if cultivated round. After they get fairly growing I don't think cultivation would be required.

Expense of Planting.

I have never calculated how much it would cost to replant an acre of forest trees, but I think it would be very expensive. The very labour of digging holes and planting is very expensive; and not only that, but the farmer would have to protect each tree. If an animal gets rubbing against a tree eight or nine years old that tree will certainly die. When the tree is ten or twelve inches in diameter it will be safe from animals.

Increased Value of Planted Farms.

If I had the means I would give a considerable amount over the real value of a farm if it was provided with ornamental and useful trees. The protection of animals from heat is a very important matter, and the subject hasn't been fully investigated. If a farm was worth $40 an acre without trees I would give from $10 to $15 more per acre for the

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same farm provided it was properly sheltered by trees. I doubt if it would pay the farmer to rent it at this price. I speak of this somewhat as a matter of fancy, but also as a matter of protection for my animals and crops.

Effect of Shade for Cattle.

I have heard the objection that, where there was too much shelter in fields, the cattle went to sleep under the trees, and would not feed: the very fact of their going under the trees with a full belly will make them fat. I have some eight or nine steers now, and recently a drover was after them. I took him to the field, and we found all these fine animals under the trees. They looked beautiful and took the drover's eye at once.

Encouragement of Tree Planting.

I don't see that the Province could do anything in the matter of encouraging replanting except by making strong representations to the farmers of its great importance. I think every man should have patriotism enough to plant a tree or two.

Cattle Raising.

My cattle have mostly Durham blood in them, and I generally put my cows to thoroughbred bulls. They have fine pasture in summer and plenty of hay in winter, and I allow perhaps half-a-dozen cows to suckle their calves every year, and I bring out some very fine stock, but I doubt if the extravagant way I go about it pays me as well as people are paid who are not so extravagant in this matter. I have no trouble in getting from $80 to $90 for each of these animals four yours old. They would weigh on an average 1,800 pounds.

Feeding Stock.

I don't feed my cattle on grain of any kind. I was in the habit of feeding two or three steers every year and bringing them in to sell in the fall; now I sell them in September in good order, and the drovers are always willing to buy them. I have not fed grain to my cattle for over four years. It takes four years to make them heavy enough for sale.

Price of Steers.

I find there is profit in keeping them over from three years till they are four years old. I would get $50 or $60 for a steer three years old, and if I kept it for another year I would get about $80. The fourth year adds greatly to the appearance of the animal.

Pasture Feed.

My pasture is fine and rich, with a stream running in each field. I don't give my animals any green fodder in the summer. These four-year-old animals fed on grass alone are in marketable condition. I sold some such last fall.

Feeding Calves.

The great art of raising stock is in feeding the calves. I think it is better to let them suck than to feed them by hand, and it saves labour besides. I attribute the good success that I have with my cattle, to my good pastures and good blood.

Seeding down Pastures.

The pasture is laid down with clover and timothy, and there is a good deal of rich natural grasses, the names of which I don't know. The age of my oldest pasture is 18

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years. There is white clover in my pasture and natural grasses. There is a considerable variety of grasses in all pastures. I attribute a good deal of my success in stock raising to the nice clear streams that flow out of the rocks. I have not heard if my grass-fed animals are well adapted for shipping, but I know they have been shipped.

Sheep—Southdowns.

On my farm in South Dumfries I had a large number of sheep. I kept the Southdown as pure as I could. Not because I made more money from them, but because they always met with a ready sale. I could always get a ready sale for these sheep on account of the mutton they produced. The wool sold pretty high, and the mutton was always in demand I have not had experience in putting pure Southdown sheep to the grade sheep of the country I brought out some pure Southdown by in and in breeding, but they continued to get smaller and smaller. I have had no experience with any other kind of sheep.

Feeding in Winter.

I have given the steers I feed a few roots in winter, but not very many. I give them hay and plenty of it. I don't give them bran. The animals are kept well sheltered in the winter. I don't tie them up. I keep the large animals in one place and the small ones in another, with liberty to go in and out as they like.

Ornamentation of Grounds.

I would advise farmers to devote some attention to ornamentation of their grounds. I have a very fine collection of shrubs which blossom all summer and which have a most pleasing effect. Annuals are too troublesome and I have taken to planting shrubs, and herbaceous plants, and have a very beautifully ornamented place. The soil on my farm is clay loam, strongly impregnated with lime. The low land of my farm or meadow is a very rich black soil.

WILLIAM ROY.

EVIDENCE OF MR. HAY, M.P.

Robert Hay, M.P, Toronto, of the firm of R. Hay & Co.—I have been engaged for forty-nine years in furniture making, and during that time have used large quantities of timber.

Black Walnut.

When I first came to this country there was very little walnut used, but one or two years afterwards it came to be used more extensively. I think it was Sir Peregrine Maitland who first introduced walnut here, and who was the first to make it fashionable. Previous to that they had used cherry, or any of the common woods. Since its first introduction, walnut has been the staple fashionable wood for making furniture.

Former Sources of Supply.

When we first commenced making walnut furniture we got the wood from Canada West. A great deal came from about Port Stanley and the banks of the Thames, in Kent, Essex, and south Middlesex. We now obtain very little walnut indeed from that part of the country.

Present Sources of Supply.

Lately we have been getting our principal supplies of walnut from Indiana. The

walnut grown in that State is as good as that grown in Canada, but as you go south of Indiana the walnut is of a lighter shade. The dark walnut grows best in a climate such as that of Michigan or Canada. I don't suppose the supply in Indiana is inexhaustible. I have been told, in fact, it will not last a great many years.

Value of Black Walnut.

When I came to Canada first they used walnut for rail fences. A very large tree of walnut now is worth $100. Walnut is worth from $70 to $80 a thousand feet, board measure. A good tree would yield from 50 to 60 cubic feet, representing a thousand feet of lumber or more, but a great many trees would not produce anything like that. The principal value of walnut is that it is an excellent wood for furniture, and is handsome in appearance. It is universally admired, has a close grain, is not liable to be much affected by changes of temperature, and at the same time it is not hard to work It is a very valuable timber economically.

Exhaustion of the Canadian Supply.

I couldn't say exactly what time it would take for a walnut tree to grow to maturity, fifty or sixty years at least. I don't know any other part of Canada where walnut is to be found except the district I have mentioned. There was a little once in the Niagara District, but that has been cut down. There is none at all north of us. I don't think any careful examination has ever been made of the walnut region to ascertain how much of the wood may still be remaining; but I am sure there can only be very little left. I have never appointed an agent for that purpose.

Replanting Desirable.

Walnut is admitted free of duty to Canada; it would be a desirable thing to replant walnut. There would be a great market for it

Cherry a Substitute for Walnut.

In supplying the place of walnut, cherry is a very valuable wood. They are using it very extensively in the United States, making ebonized furniture from it. It has a very close grain, and it is very fast disappearing. I am speaking of wild cherry. That tree grows to a fair size. We get some lumber twenty and twenty-two inches broad from it. I never saw a cherry tree growing, so that I can't say how much lumber there would be in one. I can't say whether they are high or not, but some of them grow to nearly the same girth as walnut.

The Cherry Fast Disappearing—Value.

The wild cherry forms a resource to fall back upon in the absence of walnut, but it, too, is fast disappearing. We are exporting wild cherry largely to the United States, where black furniture is very fashionable, and cherry lumber makes the best stain. I think it is as enduring as walnut. We pay now $24 at the saw-mill for real good cherry. Mr. Olliver tells me he gets $40 a thousand for it in New York. Mr. Olliver is an exporter of woods, living in Toronto. He is in company with Mr. McCracken, and they do a large business in exporting. We will soon lose all our cherry in this country. The $40 I mentioned included freight and duty. The Americans are very particular about the quality that is sent them.

American Furniture.

They make as good furniture now in New York as they do in any part of the world, but when I came to this country first the Americans made miserable stuff. The furniture in the fashionable houses in New York cannot be excelled in any part of the world.

Butternut—Uses—Price per Thousand.

Besides cherry, butternut is a useful wood. Some call it white walnut. We do not get a great deal of butternut, as we cannot use it much for furniture. It is not a substitute for the black walnut. Some houses inside are fitted up with it. I think butternut is worth about $18 a thousand.

Black Birch the Only Resource.

Black birch will be the only wood you can fall back on in a few years. In the North there is a great deal of it. It is an excellent wood. At present it is not dear because it is not scarce.

Large Quantity in Northern Ontario.

You can get any quantity of it North, and it can be purchased at the mill readily at from $15 to $16 a thousand. Black birch is to be found in all the northern regions. There is a great deal in the Manitoulin Islands, and in the Peterborough and Haliburton District. It is to be found also in Muskoka. They have been shipping birch from Lower Canada these many years back. It is quite an article of export there. Black birch is mixed with the different woods of the country in large quantities. It is very easily detected among other trees. I don't use so very much of it now, but it is on birch we shall have to fall back after the walnut is gone. It is from birch that these perforated chair bottoms are made. I think there is such a thing as bird's-eye birch, but it is very scarce. I wouldn't give more for that kind of birch than plain wood.

White Ash for Bedroom Furniture.

White ash is a very valuable wood, and makes excellent bedroom furniture. It may be used for house fittings. A good many offices are now fitted up with hardwood, and also railway carriages. Ash is used largely by carriage builders. There is no wood will stand like ash in that respect; it is next to mahogany. It is a shame to see our valuable wood cut down and wasted as it is and has been. White ash is worth $15 at the mill.

Black Ash—Basswood—Its Uses.

Black ash is worthless for making furniture. Basswood is used a good deal for some purposes; it takes the place of pine, and can be bought cheaper than clear pine. Basswood isn't worth more than $14 a thousand delivered here. We use it for a good many purposes—for drawer bottoms, drawer sides, wash-stands, and cheap furniture; it stains nicely.

The Use of Oak—Fine Oak in Canada.

The objection to oak is, it is difficult to work, and it warps like the mischief. I don't know whether this applies to English oak, as I don't know much about English oak. I learned the furniture business in the old country. There is some very beautiful oak in this country. The finest oak in this country is grown, I think, west of London.

The Maple—Soft Elm—Rock Elm.

You can get any quantity of hard maple, but it is the soft maple that is the most valuable. It is the more valuable for furniture, as it stands better and does not warp. Soft maple is not so plentiful as hard. We get our maple north of here. There are more maples than anything else in the bush. We give for soft maple at the mills from $12 to $14. Hard maple isn't worth so much. We use a great deal of what they call soft elm. We don't use much rock elm except for bending purposes. Soft elm makes a better seat for chairs than basswood. Elm is cheap. There is a gentleman of Cobocconk who has offered to deliver it here for $11. That is lower than we ever got it before. We are getting a ship load from Dresden, but it will cost us a little more.

[*Mr. Hay.*]

Elm Very Plentiful.

Elm is more plentiful than any other wood we have in the country. There is a great deal of it in all parts of the Province.

Second Growth and its Uses.

We have a little second growth timber here, and it is very valuable. Second growth ash and oak are far better than first growth. We make douels or round pins from it. The Americans make handles from it. We have been able to get a pretty good quantity of it. It would be profitable to plant ash and oak for the second growth. I don't think soft elm is any use for this purpose. Second growth ash and oak make beautiful handles; ash is used in carriages, and it bends very easily.

Replanting Necessary.

I think replanting would be better than a natural growth. There is an immense amount of money made from second growth timber in the Eastern States. It would take fifteen or twenty years before you could get any use from replanted trees. I think they should be replanted on the prairies, and in fact there is plenty of waste land nearer than the prairies.

ROBERT HAY.

LETTER TO THE COMMISSION.

The Bennet School Furniture Co.,
London, *Ont., Nov 3rd, 1880.*

A. H. Dymond, Esq., Toronto.

Dear Sir,—At a late meeting of the Agricultural Commission evidence was given, which, if not corrected, might be the means of discouraging the preservation of what is destined to become a valuable wood for the manufacture of furniture and fittings for the interior of buildings—we refer to oak.

It was stated that oak is unfit for furniture. If white oak was meant this was correct; but white oak is valuable for many other purposes; namely, staves, bent ware, and carriage work; but it is, and has been, so valuable, that it is nearly as scarce as walnut in this country, and will soon have to be imported in the same manner as walnut.

There are, however, other varieties of oak, black, or red, and yellow, of which there are large quantities in all parts of the country, both of which are well adapted for furniture, being straight in the grain and not liable to warp or change its shape, besides being easily wrought, and, when finished, there is no wood to equal it in appearance except walnut, and perhaps some varieties of white ash

We might state that we use it entirely in church furniture and school work, and it is to be regretted that so much of what is destined tc become a valuable wood is being destroyed through ignorance.

As you are probably aware, fashions change in wood like in everything else. Twenty-five years ago it was all mahogany and oak, then walnut; at the present it is imitation of ebony, mahogany coming in with a prospect of oak to follow, in which case, oak will become a valuable wood.

You will pardon us taking the liberty of writing you on this matter, but we think the public should know that oak, either red or yellow, is a good wood for any kind of furniture, and will yet become valuable, and that it should not be destroyed as useless.

Maple, either hard or soft, is unfit for furniture where large or wide pieces are required. Red beech is greatly its superior.

Yours, respectfully,

BENNET BROS.

[*Bennet Brothers.*]

DR JAMES BROWN'S EVIDENCE.

Sitting to take oral evidence held at Toronto, October 26th, 1880. *Present*—Mr. DRYDEN, M.P.P. (in the chair), Mr. DYMOND, Mr. BROWN, Mr. BYRNE, Mr. WILSON, Mr. MALCOLM, and Mr. WHITELAW.

JAMES BROWN, LL.D., Port Elgin, was called and examined

He said:—I resided in Scotland till about three years ago. I had a tree nursery there. I am now farming at Port Elgin.

FORESTRY—AUTHORSHIP—TREE PLANTING IN PORTUGAL.

Forestry has been my study, or hobby, all my life. I am the author of a book on forestry which has been through several editions. The book was first published in 1847. The fifth edition is just now being called for. I am on my way to Europe now in connection with that work, and with supplying trees to the Portuguese Government. I was acquainted with Canada previous to my coming here to live.

REPLANTING IN CANADA.

I came here in 1865 on a visit to examine the natural state of the woods, and to acquaint myself as to how they should be dealt with in artificial cultivation. I have had no experience in replanting in this country, further than what I have done about my own place. I don't see anything that should prevent Canada as a whole from reclothing itself with trees after a certain number of years.

NEW CROP OF TIMBER.

I think where they have cleared up and allowed the new crop to grow up, that a new crop would grow up in a short time without any planting at all. The only obstacle in the way of replanting is the high price of plants in the country.

REDUCTION OF PRICES NECESSARY.

Before you could do anything you would have to have trees raised from the seeds. I have been just now at Leslie's nurseries, and find there that such plants as the Scotch pine and other sorts of pine would cost about five cents each. To plant an acre at that rate would cost $50 for plants alone, independent of planting them. This rate is reckoned when planting the trees six feet apart. I think I would advise planting them as close as that. I don't think there is any reason why the price could not be greatly reduced by having extensive nurseries, in fact there is no doubt about it.

LOW RATES FOR LARGE ORDERS.

Mr. Leslie said that if he had extensive orders for them he could afford to sell them cheaper, but at present he has no encouragement to do so. In the matter of reclothing the country with forest trees, the first thing essential is to establish large nurseries for the purpose of raising young trees. I think that trees suitable for replanting could be raised so as to sell on an average for $8 a thousand.

RAISING TREES IN SCOTLAND.

You can get the same plants in Scotland for a third of that. The difference between the price here and there would be owing to the difficulty in rearing them here on account of the severity of the winter. In Scotland they require no protection, but they would require to be protected here while they were young.

LARGE TREE NURSERIES.

The best plan I could advise the Ontario Government to pursue in reclothing the country, would be for them to undertake the establishment of large nurseries. and show the people that plants could be got at a low price.

[*Dr. Brown.*]

Replanting the Forests.

I would recommend the Government to take in hand the large extents of those forests which they control themselves, and replant them as they do in many other countries, as, for instance, in Australia, where they are now dealing with hundreds of thousands of acres in this way. Their object is merely to have a supply of wood for the country, and it is a matter of national economy as well as affording shelter, which is the same object the Portuguese Government have now in view.

Native Trees Preferred.

I would recommend the Government to plant chiefly native trees, but of course there are many other trees from Europe that could be introduced. On all poor and rocky soils I would plant chiefly pine trees, but on all good land I would plant hardwood, which would be more valuable.

Growth of Pine.

From my experience in the old country I would say that it would take from seventy to eighty years for a pine tree to arrive at a merchantable condition.

Early Returns from Plantations.

But, in the meantime, in a forest, you could have all the thinnings to come out. After about a dozen years you will begin to realize a high rent from the sale of the thinnings.

Rental of Wood Lands in Europe.

I have had experience in the matter of renting of wood lands in Europe, and I know that the rental per acre would be about £5 or £6. That price would not be above the average. I have seen them rent at £8 and £10 an acre. I was one of Her Majesty's deputy surveyors of forests, and was employed to go over all the royal forests of England, and to put the keepers in the way of managing them properly.

Probable Value of Wood Lands in Canada.

I should say it would not be extravagant for Canadians to expect a third of the revenue they get in England, especially as the woods here are getting less and less every year. I should say you could make at least two-thirds of what I know is made in the old country from wood lands.

Canadian Timber Durable.

The wood in this country compared with that in the old country is more durable. The wood of the old country grows more rapidly. Here the trees in the natural forests grow closer, and the grain of the wood is closer and better.

The European Larch—Railway Ties.

The European Larch would do well in this country, and I think it would come to be valuable as a merchantable product. The larch brings very high prices in England. It is used chiefly for railway purposes, for ties and mining purposes. It is not used in shipbuilding. It is a rapid growing tree. You could have larch in this country fit for railway ties in the course of thirty years.

Trees Suitable to the Soil.

I always advocate the planting of trees suitable to the soil. On the light soil beech and larch would do very well. On a heavy soil I would plant oak, maple, ash, and hardwood generally, with firs, such as Norway firs, and various others. We have not much good oak here.

[*Dr. Brown.*

The Scotch Elm.

I should think the Scotch elm would succeed here as a hardy tree. In the north of Scotland you will find good elm trees where the frost is almost as severe as it is here. There is a difference between our tamarack and the European larch.

JAMES BROWN, LL.D.

MR. LESLIE'S EVIDENCE.

Mr. George Leslie, Jun., was called and examined. He said:

Extensive Nurseries.

To Mr. Dymond.—I am one of the firm of Geo. Leslie & Son, nurserymen and florists, Leslieville; my father and myself have been engaged in raising both fruit and forest trees for about forty years. We have not attempted to raise any trees for forest purposes yet: what we have raised has been for shelter and ornament only.

The Norway Spruce.

We consider the Norway Spruce the most valuable tree there is for planting in shelter belts; it is extremely hardy, very rapid in growth, and easily transplanted.

The White Spruce.

We have found the white spruce, a native of this country, a most excellent tree for shelter belts, but it is not so rapid a grower as the Norway, and for that reason the latter is superior.

The Black Spruce.

We have a black spruce, but it is not a good variety, as it is apt to become poor at the bottom; that is, in the early stages of the growth of the tree the lower limbs decay and are lost, while the white spruce and the Norway hold their foliage to the ground. When I speak of shelter, I mean shelter for farm buildings, orchards, etc.

Shelter Belts on Farms.

I would consider these spruces valuable to plant in shelter belts to farmers' fields they would certainly assist in gathering the snow in the winter time, and thus help to protect the fall wheat. Trees for this purpose would not require to be of great height. If farmers consulted their own interest, I think they would commence by planting out small stock, say from 12 to 18 inches high. These trees grow very rapidly, say on an average, three feet every year for the first five years, gradually lessening thereafter, and in a short time the farmer obtains a good shelter.

Importations—Hardiness—Transplanting.

As we get these trees from the old country they are two years in the seed-bed, and two years transplanted. That brings them from 12 to 15 inches in height and nicely rooted. When received in good condition we do not lose one cent. in transplanting them. If in poor condition, they are transplanted before being sold, and get a couple of years in this country, and are then removed. The tree is thus, in the latter case, six years old from the seed when planted for the purposes of shelter.

Origin of the Trees.

All that we have ever sold have been raised in the old country (Scotland). We find it much cheaper to import them than to raise them from the seed. Our climate is a little

against raising evergreens from the seed; the sun is apt to scorch and kill them when in their early growth. In the moist climate of the old country they can be grown with much less care, and are raised and sold by millions.

Price in Canada.

We sell these imported trees at from $30 to $40 a thousand—three or four cents a piece—that is to say the 15-inch ones. The 18-inch ones would be transplanted two years in this country, and cannot be sold for less than $60 a thousand. If large numbers were taken they could be sold at a much cheaper rate, say 25 per cent. off. If we could depend upon getting them every year in the same condition, they could be sold cheaper still, but we have to take an average.

Season for Importing Trees.

Sometimes they come in bad condition, from having been stowed away in warm places in the ship, and in this way numbers are apt to be destroyed. I would rather have them come in winter when they are frozen solid. A tree will stand a great deal more frost than people have any idea of without injury, provided it is allowed to thaw out naturally. The best lot of spruces we ever had from the old country came to us frozen solid. They are generally packed in dry moss, but accumulate a little moisture and freeze. We get them from the Lawson Seed and Nursery Company, Edinburgh, Scotland.

Method of Planting.

In planting a shelter belt, say an acre deep, the trees would not require to be placed closer than six feet apart; at that distance they would interlock in a few years. At six feet apart, about 1,200 trees per acre would be required, and they could be planted very cheaply by running furrows with a plough lengthwise and then across, placing the trees at the intersections of the furrows. This would give the trees sufficient depth; in fact, I would rather earth up a little than plant too deep.

A Good Shelter Belt.

I consider a good shelter belt can be made with evergreens two deep, placed say ten feet apart, with a distance between the rows of five feet, and the trees placed so as to break the spaces of the rows. A shelter belt made in this way on the north side of a square ten acre field would require 130 trees, and for the north and west sides double that number.

Cost of a Shelter Belt.

The trees would cost about 5 cents each, say 6 cents with the planting. In other words, the north and west sides of the field could be protected at a cost of very little over $6 an acre, or say $7.50 with the planting.

Advice to Tree Planters—Treatment of Young Trees.

My advice would be, unless the ground is in extraordinarily good condition to take the young trees as they are received from the nursery and make nursery rows of them, give them a little care until they arrive at the height of 18 inches or 2 feet, and then put them into permanent position. They would require from two to three years to grow to this height, and would then be a good size to transplant. After that their ordinary growth is two to three feet per year in good soil, and fully two feet in any soil, so that in six or seven years the farmer would have a good shelter.

[*Mr. Leslie.*]

Preference to Norway Spruce Alone.

I prefer the Norway spruce wholly to deciduous trees and evergreens mixed, as in the latter case the one kind checks the growth of the other.

Deciduous Trees as a Temporary Shelter.

If a row of deciduous trees were planted inside a belt of evergreens, the latter would be spoiled, but there could be no objection to planting a row of maple or Lombardy poplar very close to the fence line for the purpose of being cut down after the spruces had attained a proper size, and for shelter until that time. The deciduous trees do not protect the wheat in the winter (when protection is most needed) so well as evergreens.

The White Canadian Spruce in Certain Places.

I imagine the white Canadian spruce would be cheaper in many localities than the Norway variety; the trees could be taken from the woods and planted as in the nursery.

No Difficulty in Transplanting.

There is no difficulty whatever in transplanting these trees from the woods when young; it is simply a matter of keeping the roots moist while out of the ground. I would recommend that they should always be planted in nursery rows before being permanently placed in position, and if they have ugly tap roots these should be cut off. I would not recommend that the tops should be cut, there is no necessity for doing so, and it destroys the symmetry of the tree. There is no necessity for cutting the tops of deciduous tree seedlings.

Ornamental Trees—Arbor Vitæ—White Spruce—Balsam.

Coming to the more ornamental trees, I would recommend, of the coniferous class, our native American *arbor vitæ*, or white cedar, which is an excellent tree, and the white spruce. The balsam spruce I cannot recommend at all. It is a very pretty tree, and has very handsome foliage, until it is about twenty years old, when it gives out altogether. The *arbor vitæ* is a very long-lived tree, a moderate, though not fast grower, requires a moister soil than the Norway spruce, though I have seen it thrive very well on a dry soil. The white spruce is also a long-lived tree, and aside from these, I do not think we need anything better than the Norway spruce.

Soil—Manuring—Ashes.

It is not necessary to cultivate or manure the latter variety in any way; it will grow on stiff land, on dry sandy soil, or on soil of any kind. If evergreens are manured, it must be very slightly; a little ashes will agree with them.

Canadian Tamarack.

I do not approve of our Canadian tamarack at all. The timber is poor, and if people desire to go to expense of planting for timber, I would recommend them to plant

The European Larch,

which is a splendid tree, a rapid grower, and will grow in any part of this country. It is not an evergreen, but it throws out a great number of small branches which are a great protection.

[*Mr Leslie.*]

A Rapid Grower.

It is a very rapid growing tree, even more rapid than the Norway spruce, growing more than four feet on an average every year, unless the ground is very poor, in which case of course the growth will be less. In five or six years the tree will be twenty-five or thirty feet high.

How to Plant Larches.

I would plant larches three or four deep. I do not think it a good plan to mingle larches with Norway spruces; I would plant all larch, all Norway spruces, or all cedar.

Lawn Ornamentation.

For purely ornamental purposes, such as planting on lawns, etc., I would recommend the English ash, one of our hardiest and best trees; the purple beech, a very beautiful and hardy tree, but a little difficult to transplant; the European weeping birch, a fine, handsome tree; the Scotch elm, and our native elm, both hardy varieties; the purple-leaved elm, and striped-leaved elm, both quite hardy. The horse chestnut will not thrive much farther north than Toronto, on light soils. The European larch is a very handsome tree; our native basswood is valuable, being a quick grower and large leaved. It is coming into demand among our bee-keepers, on account of the quantity of bee food which it affords, and its coming into flower at a season when other bee food is scarce. The scarlet maple, a soft variety, is a handsome tree, and hardy; the silver-leaved maple, known as the "silver maple," is a rapid grower and hardy. The Norway maple is one of our handsomest trees, has large, green foliage, is a quick grower and perfectly hardy; our native sugar maple is also a fine tree. The mountain ash—both the oak-leaved and European variety—are good trees.

The Lombardy Poplar—Use for Fence Posts.

Some people like the Lombardy poplar and some do not. It does not harbour insects, on the contrary it is a very clean tree, but in this climate it is apt to die, and to become ragged at the top. In the latter case, however, if cut every few years it will grow more handsome with each cutting. It is being largely used for shelter purposes. The Northern Railway have ordered some thousands, and are putting them up along the line instead of fence posts, and using barbed wire to form the fencing. The wounding of the tree does not do it any harm.

Fencing with Poplars on the Prairies.

On the prairies of the West, they are used, too, to a great extent without the barbed wire. The trees are planted six feet apart, and when they have attained a sufficient height the top is cut off and nailed laterally from tree to tree as a barrier. By the time the top thus placed has decayed, a new one will have been formed on the tree. I think the height at which poplars for such purposes should be planted is immaterial; it is merely a matter of expense, as the tree has undoubtedly great vitality. They seem to grow as well if planted when they are as large as your arm as they do when they are the size of your little finger. In seven or eight years it becomes a tree of thirty feet at least.

The Balsam Poplar.

Our balsam poplar is not a very handsome tree, but it makes a good shelter. In localities where you do not want to cultivate anything, it can hardly be recommended for ornamental purposes.

[*Mr. Leslie.*]

Sycamore—Varieties of Willow.

The sycamore is a little tender north of here, (Toronto), and the tulip tree is also tender. Some willows are very pretty; the crimson bark willow, a variety of the golden willow, from which it differs in having the shoots crimson, is a reasonably fast-growing tree; the golden variety is a fast-growing and very long-lived tree. The alder is a rapid growing tree, suited to low lands, and attains large dimensions. Its economic uses are various, but it is chiefly valued for tanning and charcoal purposes. The willow makes the finest charcoal for the use of artists. All these trees that I have mentioned are suited to the climate of Ontario generally, and just about exhaust the list of those that can be depended upon.

Nursery Stocks—Climate.

We cultivate all these trees; they are found in all nursery lists. Quite a few of them are indigenous and therefore adapted to our climate. I do not think the capacity of a tree to resist our climate at all depends upon the place in which it has been raised. Trees that are hardy, though raised in a warm climate, will, if brought to Canada, be just as able to resist our climate as our native trees. A hardy tree will be hardy no matter where you attempt to grow it. I never noticed any hardening process going on before transplanting. Trees purchased from us thrive in any part of the Province, if naturally adapted to it.

Evergreen Trees.

Of evergreen trees, the most useful for ornamental purposes, is the *arbor vitæ*, in its three varieties; the American, the Siberian, and the Tom Thumb. Taking the Province, as a whole, the Virginian cedar does nicely, still I can hardly recommend it, as it is difficult to transplant.

Austrian and Scotch Pine.

The Austrian and the Scotch pine are both fine trees; they do not grow quite so rapidly as the Norway spruce, but they are good for shelter purposes, and make a pretty diversity in a belt, nearly keeping pace with it in growth. They cost about the same as the Norway spruce. The latter variety, and the white spruce are both fine ornamental trees.

Ornamental Shrubs.

In shrubs for ornamental purposes I can recommend both varieties of the barberry the common and the purple leaved; the yellow-flowering currant; the Deutzia, both *scabra* and *gracilis;* the variegated elder; the Forsythia, *viridissima* and *fortunii;* red Tartarian, white and pink honeysuckles; lilacs, all varieties of which are hardy, so far as I have tested them; the *prunis triloba*, a very hardy shrub; the snowberry, pretty and hardy; the *spiræa*, *ulmifolia*, and sorb-leaved; the *syringa*, hoary-leaved and garland; the *viburnum*, early white, and snow-ball or guelder rose; and the *Weigelia*, of the rosea variety. These are all hardy shrubs and reasonable in price.

Trees for Planting on Waste Land—English Ash

For tree planting on waste lands, or hillsides, with an economical view, I would recommend the English ash as a most useful tree. I think it would come into the market earlier than any other tree that could be planted. It is largely used for handle-making, and about ten years' growth on ordinary soil would produce a tree that could be split into four pieces, each of sufficient size to make a handle. The English ash is not the same as our common black ash; there is as much difference as between the European larch and our

[*Mr. Leslie.*]

tamarack. It is a more rapid grower than the black ash, and the wood is better in every way.

American Elm and European Larch.

The American elm, and European larch, would also be suitable for this purpose. The latter makes the best railway ties of any wood in the world, as it is almost indestructible. It is a very rapid grower, and in ten or twelve years' time the wood is of merchantable proportions, and useful for many purposes. Of course it would not be fit for railway ties by that time, but suitable for manufacturing purposes.

A Hint to Railway Companies.

It would be decidedly profitable to railway companies, as well as beneficial to the country, if the waste lands connected with their lines were planted with European larch. From this source they could in time obtain an almost inexhaustible supply of railway ties, much superior to the kind now in general use.

Ships' Knees.

Another use to which the European larch can be put is the production of "ships' knees," as it can be trained when young to the desired bend.

Hardy—Early Transplanting.

It is suited to our climate, being perfectly hardy, and very easy to transplant in the spring. It requires early transplanting, though later in the season it will thrive if transplanted, provided the roots are kept moist. As a rule, however, it should be planted as soon as the frost is out of the ground, or as late in the fall as possible before the permanent freezing of the ground. They could be imported at about the same price as the Norway spruce.

Planting—Supply.

I would not recommend planting them after they attain a height of more than eighteen inches or two feet; they are a little impatient of being moved after that time. There is not a large supply of them kept in this country; we keep a fair supply ourselves. If very large quantities were required, as for instances, if railway companies should go into their cultivation, they would have to be imported to meet the demand.

Grown by the Million—Prices.

The firm of Douglas & Co., Waukeegon, in the States, grow them by the million. The prices in the old country, however, are less than those in the States, and in either case there is a duty on the trees when imported here.

Silver Maple.

The silver-leaved maple affords excellent wood and is a fast growing tree. This tree is grown in Canada. We grow them largely. There is not a very great demand for them except for shelter and ornamental purposes. The wood is soft, smooth, of a long grain, and is very useful.

The Norway Maple the Finest of All.

In my opinion the Norway maple is the finest of all the maples. The wood is as

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hard as a bone, and ought to be useful for many purposes. I think it ought to take the place of boxwood for many purposes, for which that wood is now used by engravers, as the grain is very close and hard.

Sugar Maple—White Birch.

The sugar maple is also a useful tree in many ways. I think that about exhausts the list of really useful woods to be grown on waste lands. I think our native white birch would do well.

Arbor Vitæ on Low Moist Lands.

Many varieties of trees require to be thinned out during their early growth. The *arbor vitæ* would not, I think, do very well on hillsides, but in low, moist lands it could be planted with advantage. It is useful for posts, and is also used for making baskets, like the elm.

The Nut Family of Trees—The Black Walnut.

In the nut trees, the black walnut grows very rapidly in its younger stages—almost as rapidly as the English ash, and, at fifteen years, the wood could be used for many purposes, particularly for cabinet making. I think the black walnut would have to be confined chiefly to the front of the Province. I never saw it east of Cornwall, but the south-west portion of the peninsula is its home.

American Sweet Chestnut.

The American sweet chestnut is not quite so hardy as the black walnut; it would have to be grown further south, and requires a warm, sandy, poor soil.

The Butternut—Hickory.

The butternut is a very fine tree, and a quick grower, a little more rapid in its growth than the black walnut, and is useful in many ways. It makes capital wood for veneering. The hickory is hardy as far north as Peterborough, but is a slow grower, though it can be used for many purposes when three-quarters of an inch or an inch in diameter.

Shade Trees for Roads—The Hard Maple—The Silver Maple.

For public roads and purely shade trees the first tree I would mention would be the hard maple. The silver maple is a faster growing tree, but the soft maple proper is of rather slow growth. I would say the silver-leaved maple, the hard maple, and the Norway maple are most thrifty and desirable trees.

The Norway Maple as a Shade Tree—The Basswood.

The Norway maple is not largely used yet, but I think it will eventually be the leading tree. I think our native basswood would be a very useful tree for growing at the sides of roads, particularly in our bee-keeping sections; it is rather a rapid grower.

The Elms—Prices of Trees.

The American elm, the Scottish elm, and the English ash are also very desirable. Those that I have named I regard as the very choicest. In large numbers I imagine these trees could be got for about 25 cents apiece, when about eight feet in height, which I regard as the proper size for planting. They would be trees raised in this country, but they would have to be nursery grown, or transplanted from the woods.

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Bush Seedlings Easily Transplanted.

Anybody could obtain seedlings from the bush and make nursery rows of them. The maple sheds its seeds in July, and the seedlings are to be found in the fall or the following spring.

Seed Time and Sowing.

I gather the seed in July, sow it then, and, in the fall, I have a seedling about six inches high; in the woods the seedlings are to be found in the fall, of all sizes from an inch to two feet. They may be planted either in the fall or spring; if in the fall they should be mulched.

Experience with the European Larch.

To Mr. Brown.—I cannot point to any example of the successful cultivation of the European larch to any extent in this country. It has been used more for shelter than anything else. I have no doubt of its success under good management; in our own place we have some trees thirty feet in height.

Fifty Millions at a Cent Apiece.

If our Government should need something like fifty million trees per annum for replanting, one year seedlings one year transplanted, I could furnish them at a cent apiece, taking an average of evergreens and deciduous trees. That would be less than they could be laid down at here if brought from any other country.

Age to Plant Evergreens.

Evergreens ought to be four years old when planted, two years in the seed-bed, and two years transplanted. There has been no demand for forest trees for purposes of replanting; we have had no encouragement to turn them out by the million. We would have no demand for them if we did.

Climate Favourable for Forest Trees.

To Mr. Dymond.—If we had reciprocity with the United States we might have a market for them. The Americans compete with us, but we could produce a stock of this kind for less than they could possibly be brought in at. For raising forest trees our climate is a little more favourable than theirs.

Cultivation of Trees.

I think forest trees ought to be cared for after they are planted; they are apt to be hindered in their growth by grass climbing round them. It would pay in the increased growth of the trees to cultivate the ground for a few years after planting them, and until they become thoroughly fixed. A man with a grub hoe could go round a large number of trees in a day; of course if you can do it with a horse or a cultivator so much the better.

How to Make Forestry Popular.

Mr. Dymond: Could you suggest any mode by which we could make forestry any more popular than it is?

Forestry and the Schools—An Arboretum.

Mr. Leslie: We ought first to commence with the school-teacher and the parents of

our children. I think there ought to be attached to every school a sort of *arboretum* where the children could be taught the cultivation of all the forest trees, both for use and ornament. There would be no difficulty at all in converting some of our bleak-looking school grounds into aboretums.

Our School Grounds a Disgrace.

They are generally too small, and, as it is, I consider our school grounds a disgrace to the country. In the States we occasionally find school grounds nicely planted with trees and well cared for, but even there they are scarce, and are generally attached to large institutions.

Hand-Books—Township Action.

I know of no hand-book on forest trees that could be used to instruct beginners; such as we have are too technical. Our townships might do something towards encouraging tree planting by exempting ground from taxation, or giving prizes for the most successful specimens of forestry. I do not know any townships where this has been done; some of our village and city municipalities are giving a bonus for each tree planted on the streets.

Sales of Trees—Travellers—Spurious Trees.

We send trees to all parts of the Dominion. We employ travellers, but not to any great extent, as our sales are principally made directly to purchasers. I have heard great complaints as to spurious trees that have been imported, and in this way the volume of trade done by Canadian nurserymen is injured.

Sharp Practice.

One great difficulty we have found is, travellers going about under our name that have no connection with us at all, and as a general thing we do not discover the mischief until it is done, and the "travellers" have departed. These people are always Americans. No Canadian nurseryman need feel ashamed of sending travellers out under his own name.

Cheap Tree-Raising a Specialty.

In order to be able to sell trees in the manner I have described at a cent apiece, a man would have to make a specialty of growing them, and should the Government require a great number of them, I do not think they would find it to their advantage to grow the trees themselves. I think the nurserymen would be apt to undersell them.

Growth of Fruit Trees.

We are large fruit-tree growers, and we have a good-sized orchard in which we grow three or four hundred barrels of apples every year, besides pears and other fruits.

Summer Apples.

For summer apples I would recommend as the most profitable, the Early Harvest, Red Astrachan and Keswick Codlin. These are particularly hardy trees in fruit growing sections. In colder sections of the Province, seedlings have to be raised. There is not much money in early varieties as a rule, unless you get them shipped very early into Toronto market.

Fall Varieties.

In fall apples, the most profitable are the Duchess of Oldenburg, Colvert, St. Law-

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rence, Gravenstein, Fall Pippin, Cayuga Red Streak, Alexander, and Fameuse. These are all good varieties, and profitable in every respect.

The Real Value in the Winter Apple.

But the real value is in the winter apple. In a season of plenty like this, large quantities of early and fall apples are lost; in some places being fed to animals, and in others merely let go. There is no consumption of them if kept, and no demand for them if shipped.

Some Fall Apples Shipped Successfully.

The Colvert, however, has been shipped to the old country, picked a little on the green side, and immediately sent off. It has arrived on the other side in splendid condition. The Fall Pippin, Cayuga Red Streak, Alexander, and Fameuse, treated in the same way, have also been successfully shipped.

Early Fall Varieties.

The Duchess of Oldenburg is the earliest variety, the Gravenstein and St. Lawrence come next, the Alexander follows, then the Cayuga Red Streak and the Colvert, and finally the Fameuse and the Fall Pippin. These last two varieties will keep fairly until Christmas, and sometimes longer. I have never heard of any complaints as to the climate of England being less favourable to the keeping of apples than our own.

Winter Varieties.

In winter apples the best varieties are the Baldwin, Rhode Island Greening, Northern Spy, American Golden Russet, King of Tomkins County, Swayzie Pomme Grise, Roxbury Russet, Rambo, Yellow Belleflower, Ribston Pippin, and Swaar.

Hardy Variety of Apple.

Several of these varieties will do well even at Montreal, and some at Ottawa. The Red Astrachan is probably the hardiest of the very early apples, and is grown successfully at Ottawa, Montreal and Peterborough.

Effect of Water in the Climate.

There seems to be a line drawn right through the Province; wherever you get the water on the north side, even a great deal north of this, you get a good fruit growing country. At Owen Sound, for instance, where the water is on the north, they have a very good fruit section, and can even grow apricots and nectarines which we in Toronto cannot grow. Generally speaking, good fruit-growing sections are in the vicinity of large bodies of water; the shores of the St. Lawrence are well adapted to fruit raising, and we have a very good country at Toronto, though we cannot successfully cultivate peaches, apricots, or nectarines, or blackberries.

Hardy Fall Apples.

Of the fall varieties, the Duchess of Oldenburg, Alexander, and Fameuse, are the hardiest, and will do very well at Ottawa. For the other varieties, a warmer and more southern climate is necessary.

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Localization of Winter Apples.

Of winter apples, the Baldwin and Rhode Island Greening require the most favoured portion of the Province; you cannot take them much farther north than Toronto to advantage. The Rambo may also be classed with these varieties. The Northern Spy and King of Tomkins County are hardier. The Swayzie Pomme Grise, American Golden Russet, and Yellow Bellflower are very hardy. The Ribston Pippin and Swaar are medium.

Hardiest Varieties.

The hardiest varieties are the American Golden Russet, the Swayzie Pomme Grise, and the Yellow Belleflower, and you might add to the list the Montreal Pomme Grise, which does well at and about Montreal.

Acclimatizing Through the Seed.

My remark as to the original growth of forest trees holds good, with regard to apple trees; they must be acclimatized through the seed, where the standard varieties in cultivation will not thrive. Mere grafting or growing in any one locality I do not think has any effect at all. If you want to raise trees for a northern climate, where there is any hope of their growth at all, it must be done through the seed. If the seed is sown, the hardiest will come through and live, and the more tender ones will give way. I have raised some seedlings of my own, but none of any particular value.

Popular for Shipment.

The most popular apple for shipment is the Swayzie Pomme Grise, which is about the highest priced apple that has ever been shipped, about £5 a barrel being paid for it in Covent Garden market. The tree is an excellent grower, and will produce about three barrels of fruit a year when in full bearing.

The Best Dessert Apple in the World.

The Swayzie Pomme Grise is small, and is used entirely for dessert purposes. In my opinion it is the best dessert apple in the world. The fruit is pretty, is a perfect cinnamon russet, and, where exposed to the sun, takes on a very nice red cheek. Those specimens grown on the interior branches of the tree have no colour at all.

Very Hardy—Not Largely Cultivated.

The tree is one of the very hardiest, and in view of the demand for the fruit, it is one to which we might turn with good prospect of success. It is not largely cultivated at present; though it has been grown a long time it has not got into general cultivation for some reason. It is a Canadian tree, a native of the Niagara district, and is cultivated to some extent there.

Other Shipping Varieties.

Taking any three varieties as profitable shipping varieties, other than the Swayzie Pomme Grise, I would name the Baldwin, Northern Spy, and Greening, though any of those I have mentioned as good winter fruit can be profitably shipped.

Prices in England—Large Shipments.

I do not know anything of the price of apples in England just now, beyond that of the Swayzie Pomme Grise, but it is less than 15 shillings on an average, and that will not

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more than pay anybody. This lowness of price is owing to the very large crop of apples, and the consequently heavy shipments.

Reputation of Canadian Apples.

I think our reputation for apples is about as good as it can be, though the Americans sometimes buy our apples and brand them "American" when they are good, and when they have bad ones of their own, they brand them "Canadian."

Registered Brand—Association of Exporters.

A man might have a registered brand, but I don't know of any arrangement by which his apples could be identified after leaving his hands. That is a good idea which some shippers at Belleville have carried into practice, of forming an association, each member of which binds himself to keep up the quality of his apples, and to make his shipments everything they are represented to be. Their mode of identifying each member's shipments by placing some distinguishing ticket, or something of that sort, inside each barrel, would answer very well so long as the apples were under the control of the association, but if sold to an American firm the latter might remove those distinguishing marks and substitute their own brand.

Cultivation of Orchards—Manure.

I like my orchard cultivated. I say, have only one crop on the one piece of ground, but as between cultivation and non-cultivation, I prefer the former. I believe it pays. I believe too, if a man has a large quantity of manure he can raise fine fruit by scattering it through the orchard and letting it go.

Mr. Meehan's Advice.

Mr. Meehan, one of the most scientific fruit-growers in the United States, recommends this practice altogether. He says: "Mulch your trees every year, but do nothing else in the way of cultivation than take a hoe and knock down the weeds; by this means you will not stir the soil, and will keep the roots near the surface. Feed your trees annually, and you will get good fruit annually."

Planting Apple Trees—Standard.

About thirty feet apart, or thirty by twenty-five, I consider the proper distance to plant apple trees. The best kind of tree is a half-standard, that is, a tree with a low stem, say about three feet high.

Wind Breaks.

I think it will always pay to protect apple trees by wind breaks.

Pears—Varieties.

In pears I have seen nothing yet to beat the Bartlett; the tree bears well and the fruit is good. I would also recommend Clapp's Favourite, Flemish Beauty, Louise Bonne de Jersey, Beurre Hardy, Belle Lucrative, Beurre Giffard, Duchesse d'Angouleme, Beurre Clairgeau, Beurre d'Anjou, Lawrence, Vicar, Sheldon, Oswego Beurre, and Tyson. This is rather an extended list, but they are all good varieties.

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Market for Pears.

We have no market for pears but the home market, and the Lawrence and Vicar are the only pears we could ship. The others don't carry well. Pear culture is reasonably profitable here. I think the Lawrence and the Vicar varieties would be likely to take in the English market.

Pear Blight.

I have had a good deal of experience as to the pear blight, but I am at sea as to the cause of it. It has struck me, however, that it is a disease of the roots, and that the sap becoming diseased there, travels to the terminal shoots, where the blight always begins. It will affect a tree from the time the first leaves appear until the end of the summer, and is known as the American blight, from being indigenous to this Continent. It is wholly unknown in England, France or Belgium.

Peaches—Plum Culture.

We cannot grow peaches successfully here, and I am not very familiar with peach culture. Plums are grown to a considerable extent in this district, and the increasing demand for trees shows that their culture must be profitable. We have no tree that is proof against the curculio; even the wild plum is not. There are a few varieties very productive, snch as the Lombard, so that they will always bear a crop, notwithstanding the ravages of this pest.

Best Varieties of Plums.

We have found the best varieties for this section to be the Lombard, Peach, Yellow Egg, Imperial Gage, Bradshaw, Prince of Wales, Reine Claude de Bavay, and Pond's Seedling. That is a fine lot of plums, and all these varieties do well, and are reasonably hardy. The Bradshaw is perhaps the least hardy, though it does well in this district. The plums I would recommend for shipment are the Lombard, Yellow Egg, Reine Claude de Bavay, and Coe's Golden Drop. I have had no experience in shipping plums to Europe. It is doubtful whether it could be done profitably, though perhaps Coe's Golden Drop, the Yellow Egg, and Reine Claude de Bavay could be shipped with profit if they could be taken through quickly.

Raspberries.

We have grown raspberries profitably, and have found the Franconia the best yet. It is an old variety, and sometimes winter-kills a little We find the Philadelphia reasonably profitable; it is hardier than the Franconia, but the fruit is soft and has not so fine a flavour.

Planting—Picking—Cultivation.

We grow raspberries in hedge rows and pick them in pails, the same as wild raspberries, with the exception of the Franconia, which we pick altogether in baskets, like strawberries. The plants are placed eighteen inches or two feet apart, and the distance between the rows is about five feet, so as to allow a horse and cultivator to pass through. The old canes are cut out, and the cultivator passed through in one direction. Under this system the plants do very nicely, and seem more hardy and more productive than by any other.

Strawberries.

We have tried a great many varieties of strawberries, but do not cultivate them for market on a large scale, growing them mainly for the plant. The variety which we have found best so far is Wilson's Albany. It has rather an acid flavour as generally picked.

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It is not ripe when it is red, but must be nearly black before perfectly matured. The Sharpless is a new variety, bears very large fruit, is a good grower, and I think is a very promising berry. The Jucunda is one of the very best varieties and ought to be more cultivated than it is. It is a magnificent berry for shipping, the fruit being large and beautiful, and the plant productive and good in every respect. The Crescent Seedling is very productive and the berry rather attractive.

Grape Cultivation—Varieties.

I have not paid any particular attention to grape culture, our land not being very well suited for it. The variety for which the greatest demand has existed during the last two years is Rogers' No. 4, which is used principally as a table grape.

Wine Grapes.

The Clinton, which is a small grape, is still largely in demand for wine purposes, for which I think it is one of the very best. It yields a large crop and is very hardy. I think the Clinton makes a finer wine than the Concord, as the latter is a little too foxy in its flavour. The Delaware is an excellent grape, but it requires high cultivation and there are better varieties.

The Clinton as a Wine Grape.

If I were planting a vineyard of several acres for purposes of wine-growing, I would certainly use the Clinton as the backbone of the yard. It would altogether depend upon the class of wines I wished to produce. Some of the finest wines are made of a mixture of several varieties; but a good wine can be obtained from the Clinton itself. The Clinton is free from any foxy flavour.

Gooseberries.

To Mr. Brown—The best varieties of gooseberries are Downing's Seedlings and Smith's Improved, and, for canning purposes, Houghton's Seedling. These are always reliable and never mildew, at least they have not done so with us. The English varieties in some localities will do very well on heavy clay soils, but none of them will resist mildew. The Whitesmith will grow well in some localities, and on heavy soils.

Robins and other Birds.

To Mr. Dymond.—We suffer a good deal from the robin, and cedar or cherry bird. I have never observed the robin to do anything in return for the fruit he consumes; I never saw a robin devour an insect. He does not touch tent caterpillars, but will eagerly pick up earthworms. In fact, I see no value in the robin at all, and I think his destructiveness and that of the cherry bird are so great that they ought to be left out of the list of protected birds. There is no other bird that I have noticed as particularly destructive, that is, among those that remain regularly with us. One year a cross-bill dropped down upon us when the trees were in blossom and committed great havoc among them, but he was only a visitor.

The English Sparrow.

We have English sparrows with us, but so far as I have seen they are not destructive, though I cannot see that they do any good. They seem to feed altogether along the road sides, and do not appear to go five yards from the streets.

Graminivorous and Pugnacious.

From the fact that they consumed a field of oats belonging to a gentleman in our

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vicinity to the distance of about 100 yards from the fence, I should say they are graminivorous. I have never seen them touch an insect, though Mr. Allan, of Goderich, informs me that they devoured the worms on the cabbages in his garden. The sparrow is a pugnacious little animal, and drives away a good many valuable birds. It is, however to insects that we must look for deliverance from insects more than to birds.

Black Currants.

The black currant is cultivated largely in this district, and meets with a ready sale at about $4 a bushel, and sometimes more. Its culture at this price is profitable. I should say about eighty bushels of black currants can be grown to the acre.

Average Yield—Prices—Returns.

I am planting the bushes now four by four, and taking the average yield at a quart a bush, which is a fair one, one year with another, the gross return per acre would be $300, which would give a fair profit on the investment. About 2,700 plants are required per acre, and they would cost about $4 a hundred, or $108 an acre. This does not include the cost of planting.

Transplanting—Cultivation.

They are generally transplanted when two years old. If they get any reasonable cultivation the bushes will remain in bearing for about ten years—much longer under a proper system of manuring. They are very ravenous. I prefer stable manure to any other kind. They will do very well on almost any soil; but if the soil is light, they ought to be kept mulched the year round, and the same with all small fruits.

Red and White Currants.

The cultivation of white and red currants is not so profitable as that of black, although they are more heavy bearers; still they yield a fair return to the grower.

Black Currants very Profitable.

The market for black currants is first-rate; there is never an excess. They are used for preserving, and there is always a scarcity rather than a surplus. I have never known the price to be less than $3.50 a bushel in Toronto market. As a rule we have a good crop every season unless a late frost occurs, when the bushes are in blossom. This happened last year, and the crop was consequently short. I have found Lee's New Prolific Black the best variety, and next to that the Black Naples, properly so-called. A great many spurious varieties have been sold in this country under the name of the Black Naples, which were perfectly worthless. Mr. Hessin uses large quantities of black currants, more for confectionary purposes than actual preserves.

GEORGE LESLIE, Jr.

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LETTER FROM THE HON. G. W. ALLAN, SENATOR, ON FORESTRY AND ARBORICULTURE.

WRITTEN AT THE REQUEST OF THE COMMISSIONERS.

MOSS PARK, TORONTO, *Nov. 24th, 1880.*

A. H. DYMOND, Esq.,
Ontario Agricultural Commission.

DEAR SIR,—In compliance with my promise I send you a few brief memoranda on forest trees and tree planting.

PAST OMISSIONS.

In regard to our forests, I think it is very much to be regretted that the Government of Old Canada, as well as the Government of Ontario, did not, in reference to some of our forest lands at all events, adopt something like the same system, which has long been pursued in many countries in Europe, in the management of their forests.

AN OBJECTION ANSWERED.

It may be objected that the European system would have been incompatible with the circumstances of a country, where the settler always follows the lumberman, but I venture to think, that a very great deal of the land now occupied by settlers in the more northern parts of Ontario, had far better have been dedicated to the lumberman in perpetuity.

EUROPEAN FORESTRY.

If in some of our finest pine districts for instance, timber cutting had been carried on under something like the same regulations as practised in the larch and pine forests in the Tyrol, and in some parts of Germany, the supply would still be inexhaustible for many years to come.

OUR FORESTS DISAPPEARING.

As it is, our forests are rapidly disappearing year by year, before the axe of the lumberman who is unrestrained by any regulations in regard to his operations within his timber limit, and what little he leaves, is soon swept away, or rendered comparatively valueless, by bush fires.

BUSH FIRES.

To this latter most destructive agency is due the loss of hundreds of thousands of dollars-worth of valuable timber of all kinds, all over the country, and the evil seems to have become chronic, for not a summer or autumn passes without some district or other being more or less ravaged by these bush fires,

RAILWAY FUEL CONSUMPTION—SERIOUS EFFECT.

If in addition to the operations of the lumberman, and the destruction caused by bush fires, we take into account the large area of timbered lands annually cleared of all their wood, to supply the different railway lines with fuel, (and anyone who has not looked into the statistics would be astounded to find the acres of wood which it takes to feed even one of our shortest railway lines for a year!) we shall not be surprised to find, that year by year, our crops are suffering more and more for lack of the protection which the intervening tracts of woodland formerly interposed to cold sweeping winds, and sudden

changes of temperature, or to find, that, as in other parts of the world, the entire denuding of the country of its forests is having a most injurious effect upon the rainfall.

What Can be Done?

It becomes then a most important question whether anything can be done by planting to counteract the injurious effect upon our climate and crops which the rapid destruction of the original forests will surely entail upon us, as well as to furnish a supply of fuel to our farmers, and timber enough to meet the requirements of an ordinary farm for fencing and repairs, if not for building purposes.

Management of Standing Woods.

And here let me remark in passing, that, in this country, where tree growth is so rapid, if every farmer who has not been so recklessly improvident, as to leave himself without a few acres of bush on his farm, would only manage his bits of woodland, be it twenty, fifteen, or even ten acres only, carefully and systematically, it would keep him and his children after him, supplied with fuel, and to a great extent with timber for fencing and repairs on the farm.

Results of Economical Management.

I have known instances of pieces of woodland of from twenty to twenty-five acres in extent, which have been thus systematically cut now for twenty years, and upwards; no tree under a certain diameter was allowed to be touched; all the young growth of beech, oak, maple, elm, etc., was carefully protected; and the result has been, that these comparatively small "reserves" have continued to furnish, under the same management, sufficient fire wood for the wants of their owners, as well as much useful material for repairing fences, gates, and out-buildings.

A Denuded Country.

On many farms in Ontario, however, not an acre of wood is now left, and on many more, the small "reserves" are rapidly dwindling away, so that planting would seem to be the only means of providing—at least in country districts—a supply of firewood for the future, unless our farmers are to burn coal, and become dependent in a great measure for their fuel on a foreign country.

Tree Planting the Remedy.

To planting, too, we must look for the shelter we so much require for our growing crops; and to planting I venture to think, we ought to look for a supply of such timber as may suffice for fencing, repairs to out-buildings, and the various small wants of a farm.

Ornamental Planting.

I do not propose to say anything on the subject of ornamental planting. Canadian farmers generally, have not hitherto been given to spending much money for such purposes, but a decided advance has been made in these respects, within late years, and we may fairly hope that a taste for such things, and desire to make the home pleasant and attractive, by surrounding it with beautiful trees and shrubs, will increase more and more as time goes on.

Shelter Belts on Farms.

Planting for shelter round the fields, and on rough and vacant places on the farm, is what I more especially wish to touch upon.

[*Hon. G. W. Allan.*]

The Mischief done by Want of Protection.

Every farmer knows the mischief that is frequently done to the wheat in winter, from the protecting covering of snow being blown away by high winds sweeping over a treeless expanse of country, and in the spring, when a warm rain is often succeeded by a cold biting northerly wind, how much injury is done to the young clover and the spring crop, which a little shelter would have very much mitigated, if not entirely prevented.

Nursery Trees.

How best to provide this shelter, is then really the important question, and many farmers have already done much towards it by planting rows or belts of evergreens, as well as deciduous trees, round the more exposed portions of their farms. Undoubtedly when the farmers are so situated that they can procure what they require for their purposes from the nursery gardeners, the young trees, particularly the evergreens, are better rooted, and consequently less liable to suffer in transplanting, than trees taken directly from the woods.

The Norway Spruce.

Of these nursery trees, the Norway Spruce Fir is certainly one of the handsomest evergreens, and most desirable in every way. It is very hardy, of quick growth, and adapts itself to all situations, and what is a great recommendation, does not, like the balsam fir and some other of our native spruces, lose its lower branches and become thin and scraggy below as it increases in age.

Trees from the Woods.

Take, however, even an ordinary sized farm, say of 200 acres, and if planting is to be carried on to any extent, trees from the nurseries will be found rather too expensive a luxury, and the farmer must rely upon what he can obtain from the nearest woods.

Careful Transplanting.

These—if carefully transplanted, and in the case of evergreens more especially, of not too large a growth, when moved—ought to succeed perfectly, or at least there should be a very small percentage of loss.

White Pine—Black and White Spruce—White Cedar

Of our native evergreens, the White Pine, Black and White Spruce, and White Cedar, can all be easily transplanted.

The Norway Pine.

The Red or Norway Pine, than which there is no handsomer tree when allowed to grow singly and with plenty of room for the spread of its branches, is very difficult to move, and will not generally succeed, unless taken up with great care when very young.

The Hemlock Spruce.

The Hemlock Spruce, one of the noblest and most picturesque of our native evergreens, is of very slow growth, and is also difficult to transplant, except when very young, but both it and the White Cedar make most excellent hedges.

[*Hon. G. W. Allan.*]

Deciduous Trees—Elm—Ash—Beech—Oak—Maple.

Of our deciduous trees, the elm, ash, beech, oak, and maple, are the most generally and easily obtainable. The maple (both of the hard and soft varieties) bears transplanting remarkably well, and grows rapidly. The different varieties of elm can also be easily moved—so also the ash. The oak, both white and red, as well as other varieties, is difficult to move with safety, and is of less rapid growth than either the maple or the elm.

Butternut—Walnut—Sweet Chestnut.

The butternut, if transplanted when young, succeeds well. The walnut and swee chestnut I have no experience of, except as transplanted nursery trees, Take, however, al the others I have named, both evergreen and deciduous, and they can generally be obtained in most parts of Ontario, without having to go any great distance to find them.

Deciduous Trees as Shelter Belts.

Of course where complete shelter against cold winds in winter is desired, a belt or even a single row of evergreens is the best thing to plant, but if evergreens are not easily obtainable, deciduous trees planted two or three deep will be found no small protection, as the force of the wind will be very much lessened by passing through even the bare boughs and twigs, if the belt of trees be thick enough.

Fence and Road Planting—Waste Places.

Besides providing shelter against the cold north, I think planting, particularly of quick growing deciduous trees, should be extended to the rest of the farm, along the fence borders of the different fields, on the sides of the lanes, and wherever there are any broken or waste places that cannot be conveniently cultivated.

An English View of the Matter.

I am aware that it may be objected to this tree planting around our fields, that the roots will draw away much nutriment from the growing crops, which may also be more or less injured by the shade cast by the trees, and it may be urged that in England, on some of the most highly cultivated farms, they have been grubbing up the hedges and cutting down the hedge-row timber.

Different Conditions.

The climate and general conditions of the two countries, however, are so different that there can scarcely be any analogy between the two cases. besides, this grubbing up of hedges and trees in England has been mainly for the purpose of converting small inconveniently shaped enclosures, of perhaps a few acres, into large, rectangular fields, which could be cultivated to better advantage. In this country the farms are almost all laid, out in square fields of 5 or 10, or 20 acres, and the shade from trees planted round their sides in such a climate as ours, is not likely to affect the crops injuriously if it be done judiciously, and with due regard to the size and situation of the field, while the little plant food which their roots may abstract, will he more than compensated by the gain to the farmer in other respects.

Recapitulation of Advantages.

What this gain will be I may again briefly repeat. First, shelter to the crops: secondly, the influence upon the rain fall; thirdly, a provision for the future supply of firewood,

[*Hon. G. W. Allan.*]

and of material for gates, fencing, mending waggons, sleighs, and farm implements, and repairs to buildings.

How to Secure Them.

All this I maintain can be secured to a great extent:—

(1) By judicious planting of rows of trees round the borders of the fields.
(2) By planting small belts of wood on the more exposed parts, and
(3) Wherever there is any broken ground, or unoccupied corners that cannot be cultivated to advantage, by planting them thickly with trees also.

The Plantations Utilized.

By the time that the few remaining acres of "bush" on the farms have entirely disappeared these "plantations" will have attained a growth, which will render them available when thinned out from time to time, for the purposes I have indicated, while, so far as the rain fall is concerned, if such a system of planting were generally followed, it would counteract in a great measure the ill consequences that are sure to follow upon a *treeless* condition of the country.

Growth of Forest Trees.

In enumerating the trees which I consider desirable for planting, I named only those which could generally be obtained without any great difficulty or expense, in almost any part of Ontario, and I shall now give some data, which will show what growth these trees will attain within a specified time, taken from memoranda kept by myself, or which have come into my possession, and for the accuracy of which I am prepared to vouch.

The Elm.

Elm trees taken from the woods as young trees of about 6 inches round the stem, and between 8 and 9 feet high, have attained, in forty-five years, a height and girth round the stem at 3 feet from the bottom, in several instances as follows:—One 60 feet high, 8 feet in circumference at 3 feet from the ground; one 65 feet high, 8 feet 2 inches in circumference at 3 feet from the ground; one 60 feet high, 7 feet 9 inches in circumference at 3 feet from the ground. Another elm planted about fifty years ago, a small tree from the nursery gardens, has now grown to a height of 70 feet, with a girth at 3 feet from the ground of 8 feet 6 inches.

The Red Oak.

A red oak, planted as a sapling about forty-eight years ago, is now nearly 50 feet high, and measures 5 feet 8 inches round the stem at 4 feet from the ground.

The Maple.

A maple of the same age, is 6 feet 5 inches round the stem, and nearly 60 feet high, and two others planted within the same period, are 6 feet in girth at 4 feet from the ground, and between 50 and 55 feet high.

Age When Planted Out.

All three of these were, when planted in their present position, young trees about 6 or 7 feet high—just the size at which they can be most safely transplanted when taken from the woods.

[*Hon. G. W. Allan.*]

The Beech.

Of beech I have no record that I can entirely depend upon, but I believe one that I measured, which gave nearly 4 feet as the girth at about the same height from the ground and was about 38 feet high, has been planted over forty years.

The Butternut.

A butternut between forty-seven and forty-eight years old, measured 6 feet round the stem (4 feet from ground), and has attained a height of 75 feet.

The Ash.

Of two ash trees planted fifty years ago, one is 60 feet high, with a girth of 6 feet 5 inches; the other about 55 feet high; girth a little over 6 feet. (3 feet from ground.)

The Elm the Fastest Grower.

It will be seen from this memorandum that the elm has made the most rapid growth of all these trees, and the maples come next; although the ash is close upon them.

Evergreens—The White Pine.

Of evergreens (native), I can only give with certainty the white pine. Two of these—both planted fifty years ago—have reached, one a height of nearly 70 feet; the other a little over 60 feet. One measures 6 feet 6 inches; the other a little over 5 feet, at 4 feet from the ground.

A Fifty Years' Average.

It will be seen, therefore, that, within an average of fifty years, trees transplanted at just such a size as they can be safely and conveniently taken up when growing in the woods (say from 5 to 6, 8, or 10 feet high), have attained dimensions, which render them very valuable as firewood, as well as being perfectly sufficient for many useful purposes about a farm, for which timber of a moderate size is suitable and requisite.

Replanting Practical and Economical.

I do not think that, with such facts as these, it can be said that there is anything visionary or impracticable in the means I have suggested for meeting the coming scarcity of timber in Ontario, and supplying the wants which will soon make themselves felt, even by the present generation of farmers, and will certainly press heavily upon their children, if not provided for in some way or other.

The Larch.

Of course there are many other kinds of trees, besides those I have enumerated, which could be planted to excellent advantage; the larch, for instance, which in suitable situations makes a rapid growth, and is valuable timber for many purposes. I cut down one the other day, which measured 6 feet 4 inches round the stump, 4 feet from the ground, and was 65 feet high. The rings showed the tree to be about fifty-one years old.

The Black Walnut.

I may instance a black walnut tree planted by myself not more than thirty-six years

[*Hon. G. W. Allan.*]

ago, taken from the nursery ground as a young tree of 8 or 9 feet high, which has now attained the handsome height of over 50 feet, and measures 5 feet 2 inches round the stem, and for many years has yielded an abundant crop of walnuts.

An Appeal to Farmers.

I have purposely forborne, however, from giving any other examples than those which any farmer can verify for himself by the trees he can procure from the nearest woods. Let him but try the experiment of planting, fairly and with ordinary care and judgment, and I am satisfied that he will be amply repaid for the trivial expense, and the small expenditure of time and labour, by the result which will accrue, not only to his own benefit and advantage, but to the comfort and advantage of his children after him.

G. W. ALLAN.

MR. JOHN GRAHAM'S STATEMENT.

Mr. John Graham, of Wallbridge, Sidney Township, County of Hastings, was summoned as a witness at the sitting of the Commission at Belleville, but, failing to receive the notice sent to him, has forwarded the following statement:—

Dear Sir,—Mr. P. C. Dempsey, of Albury, informs me that you notified me by letter to attend a meeting of the Agricultural Commission lately held in Belleville, which notice I assure you, I never received, otherwise I should have been in attendance; he also informs me that you wished me to answer a few questions in the horticultural department, and particularly with regard to the advantages we have received, and hope to receive, from forming ourselves into a fruit-shipping company.

Successful Apple and Pear Culture.

I have been engaged in horticultural as well as agricultural pursuits for the last twenty-five years, and I must say that I thought myself quite successful in growing both the apple and the pear, until last spring, about 15th of May, my pear trees of fifteen years were stricken with the leaf blight.

Pear Blight—Stricken Varieties.

We had a severe frost when the trees were in full bloom, which, I presume, was the cause. Some recovered, others died outright. Among the blighted were, the White Doyenne, Beurre d'Anjou, Flemish Beauty, Clapp's Favourite, and Duchess d'Angouleme.

Varieties that Escaped Blight.

The Bartlett, Tyson, Howell, Louise Bonne, Rostezier, and Beurre Clairgeau escaped unhurt. I think it is just as easy to raise the pear as the apple, if planted in a good, dry clay loam soil, only they are all more or less subject to blight. When one dies I always fill the vacancy by planting another.

Apple Growing in Hastings.

Apples in general do well in this locality. The Baldwin and Spitzenberg are rather tender, but they do pretty well on a dry clay loam.

Grape Culture.

The grape invariably does well when planted on high land; even the Isabella ripens

[*Mr. J. Graham.*]

on an elevated situation, while on low ground they get injured by the late and early frosts.

Plums—Peaches.

Plums do well along the bay shore, but, back in the country, while the tree flourishes it is impossible to save the fruit from the ravages of the little Turk. The peach has not been cultivated to any extent, still there are a few trees in this district that have borne good fruit.

New Orchards—Export Trade.

A large number of young orchards have been planted in Hastings, Prince Edward, and adjoining counties with the intention of shipping to foreign markets. Among the most extensive is that of Dempsey & Day near Trenton; they plant principally winter varieties.

A Fruit Shipping Company—Objects.

With respect to the object we had in view in forming a Fruit Shipping Company; in the first place, we expect to reap the benefit of each other's experience in growing and shipping fruit, and as all of us have young orchards beginning to bear more fruit than we can profitably dispose of in our local markets, we expect, by careful picking, selecting, and packing, to establish a character as fruit growers that will enable us to compete in the foreign markets with the best fruit growers of the continent.

Method of Packing Apples—Careful Selection.

If apples are to be packed in the orchard we would advise (as has been practised by some), that a tent be put up (to shade the apples from the sun), with a table under it; nail three or four inch strips on the sides and ends to prevent the apples from rolling off, cover it with woollen cloth, so that the pickers may empty their baskets without injuring the fruit; let the packers select the fruit, rejecting every one that is under size, spotted, wormy, or deformed in any way; let the fruit be of a fair uniform size, as it will not pay to send them in any other shape to a foreign market. Don't be tempted to ship medium and large apples in the same barrel. Ship medium-sized in barrels by themselves.

Care in Picking Important.

Pick the apples from the tree; lay them down, don't throw them the whole length of the arm into the basket so that they will rattle against each other; empty them carefully upon the table for selection; put the large by themselves; the medium by themselves, and the culls by themselves.

Cheap Freight by Combination—Better Prices.

We have already had the advantage of cheap freight by combining and shipping by car-loads instead of small quantities, which enables us to forward them to English markets, which we could not do if we shipped them in small quantities. Again, we have reaped full fifty per cent. in the Montreal markets above what the same fruit would have brought in our local markets, just by careful selecting and packing, while other apples, with less care in packing, brought, as was admitted, almost nothing.

A Good Trade.

Again, Mr. P. C. Dempsey, President of the Fruit Growers' Association, forwarded a barrel of apples by express to a gentleman in England, which induced that gentleman to ask the question, "How long will you supply me with such fruit at 22 shillings (say,

$5.25) per barrel?" The correspondence resulted in an order for quite a number of barrels, which left Mr. Dempsey $3 per barrel after paying all expenses, while the best grade in our local market bring $1.25 to $1.50 per barrel.

Results of Combined Efforts.

I might just say that our Company has not existed long enough for me to say much from experience, but I consider we have gained fifty per cent. from what few transactions we have had in shipping fruit.

Members' Regulations.

In shipping it is required of each member that he puts his initials on the head of each barrel and his card inside.

Method of Selling.

The commission merchant to whom we consign is instructed to sell the fruit of each brand on its own merits and make his report accordingly, so that each one receives his just due according to the value of his fruit.

No "Black Sheep" Tolerated.

So you see that, as the buyers in a foreign market get accustomed to the marks, if we have a "black sheep" in the flock he will eventually weed himself out, but we do not intend to admit any person who has not first established a character as an honest upright packer. By careful selection, and careful, honest packing, I do not see why we should not anticipate a bright future.

A Suggestion to the Commission.

I beg leave to make a suggestion to your Commission:

More Care on the Voyage Needed.

Some of the Liverpool commission merchants complain of the reckless manner in which the apples are cared for during the voyage. They say that apples stored in certain parts of the vessel always arrive in a damaged condition, while our most delicate fruit, stored in the forward part of the vessel, arrive apparently as fresh as the day they were shipped; therefore I would suggest that your Commission lay the case before the marine companies, try to enlist their sympathy enough if possible to remedy the evil. In doing so you would confer a great boon upon the fruit growers in general.

JOHN GRAHAM.

To A. H. Dymond, Esq.,
Agricultural Commission, Toronto.

STATEMENTS

RELATING TO

FRUIT GROWING AND FORESTRY

—FROM DISTRICTS NOT DIRECTLY REPRESENTED AT SITTINGS TO TAKE ORAL EVIDENCE—SUPPLIED IN ANSWER TO PRINTED QUESTIONS.

BRUCE.

FRUIT CULTURE IN BRUCE.

The fruits cultivated in this district are: apples, pears, plums, cherries, strawberries, gooseberries, raspberries, and currants. A few peaches have been planted, mostly seedlings raised locally, and no experience has yet been gained of their quality or ability to stand the climate. Fruit cultivation is comparatively in its infancy in Bruce.

APPLES THE CHIEF CROP—YOUNG ORCHARDS.

Of the whole fruit crop, apples probably represent nearly three-fourths, and plums a little less than one-fourth, the balance being made up of other varieties. Fully one-third of the orchards are young trees not yet in bearing. The small fruits are cultivated chiefly for private use.

SUMMER APPLES.

Of apples, the fall and winter varieties predominate, although recently summer apples have been grown to some extent. Of summer apples the most successful are the Early Harvest, Red Astrachan, and Summer Pearmain. They realize various prices, according to the season and demand, ranging from $1.00 to $3.00 per barrel. The local demand is sufficient to consume the whole crop.

FALL APPLES.

Of fall apples the most profitable sorts are found to be the Fall Pippin, Gravenstein, Duchess of Oldenburg, Fameuse (or Snow apple), St. Lawrence, Maiden's Blush, and Colvert. The price ranges from $1.50 to $2.00 per barrel.

[*Bruce.*]

HARDIEST FALL SORTS.

The hardiest fall varieties are found to be the Duchess of Oldenburg, Fameuse, Gravenstein, Alexander, Maiden's Blush, and Colvert. The demand equals the supply, and none have been shipped to other parts so far.

WINTER APPLES.

Of winter apples, the Rhode Island Greening, King of Tomkins County, Northern Spy, American Golden Russet, Spitzenberg, Baldwin, Ribston Pippin, Peck's Pleasant, and Talman's Sweet are all highly esteemed and succeed well. There has, as yet, been no exportation of winter apples. The local price is from $1.50 to $2.00 per barrel. No seedling varieties of any merit have yet been heard of.

CLIMATE—BORERS—BLIGHT—CATERPILLARS.

None of the standard varieties have been found too tender for the district. The apple trees have, so far, escaped blight. The borer has appeared in places, and has been more or less destructive. Very few tree caterpillars have been noticed.

PEAR CULTURE—VARIETIES.

Pears are grown successfully in some parts of the county, although not universally successful. Pear culture is at present carried on upon a small scale only. The Bartlett and Flemish Beauty are the most successful varieties. The price obtained is from $2 to $3 per bushel.

BLIGHT—SLUG.

No signs of pear blight have yet been detected. The slug has been slightly destructive to the leaves in some cases.

PLUMS—VARIETIES.

Plum culture so far as tried has been successful. The common Blue Plum, the Gages, Yellow Egg, Sugar Plum, Washington, and Lombard, are the varieties grown. The two last named sorts would be most profitable for market, but the demand is purely local. The prices for plums are from 50 cents to $1 per bushel.

THE CURCULIO—BLACK KNOT.

The curculio is already on hand and doing considerable mischief. With that exception the plum trees of the district are generally free from disease or insect pests. Black knot is not much known.

CHERRY GROWING—BIRD CONSUMERS.

Cherries are grown successfully; the Kentish, May Duke, Black Tartarian, and Early Richmond, being the principal varieties. The crop is chiefly consumed at home, and if one correspondent is correct, largely by birds, the robin being the chief depredator, ably assisted by the woodpecker, blackbird, and wax-wing.

GRAPE CULTURE PROFITABLE—VARIETIES.

Grapes grow well, but their cultivation is confined to amateurs or small growers. The Concord and Delaware are the most profitable. The Crevelling, Burnet, some of Rogers'

hybrids, and, for wine, the Clinton are all grown. The fruit usually sells at from 5 cents to 10 cents per pound.

STRAWBERRIES—RASPBERRIES—BLACKBERRIES.

The soil is generally too heavy to encourage the growth of strawberries on a large scale. Wilson's Albany is the favourite with local growers. The wild raspberry is a very powerful competitor with the cultivated plant. The Philadelphia variety of the latter is the one most preferred. When marketed, raspberries bring 5 cents per quart. Very few blackberries are grown. Currants can be profitably cultivated. The common Red, Cherry, common White, and Grape, are grown. The fruit sells at from 8 to 10 cents per quart. The currant borer is seen, but is not very troublesome. The currant worm is destructive unless kept under. Black currants of the Black Naples variety, do well and realize 10 cents to 12 cents per quart.

GOOSEBERRIES A SUCCESS.

Gooseberries are a success; the Houghton, Downing, Smith's Improved, and Kent's Early, are doing well and selling at 10 cents per quart. They escape mildew, but are liable to the attacks of the currant worm.

THE STANDING TIMBER.

With the exception of a portion of the most recently settled districts, a very small area of the county is under the original bush, and the extent of second growth timber is insignificant. The standing timber includes oak, elm, ash, pine, cherry, maple, beech, basswood, birch, larch, willow, sumach, ironwood, hemlock, cedar, and tamarack.

USES OF THE TIMBER.

Some oak, white ash, elm, and maple are used in the manufacture of agricultural implements. Oak, white ash, maple, basswood, pine, and elm, are employed in the construction of vehicles. Maple, cherry and elm find a market with the furniture manufacturers, cherry, for the last named purpose, being the most valuable of the three woods. For railway ties, hemlock, cedar and tamarack are in some demand.

THE OLD FORESTS—REPLANTING.

No attention is being paid to the systematic preservation of the old forests, and very little to the replanting of trees in place of those removed by clearing.

LAMBTON.

FRUIT CULTURE IN LAMBTON.

Apples, pears, plums, cherries, grapes, currants and melons, are cultivated in this district. More than two-thirds of these are apples. About little more than half are in full bearing. The time at which apple-trees begin to bear depends largely on the soil, and also on the cultivation that they receive. The Hawthornden bears about three or four years after grafting, but the Northern Spy generally takes ten or twelve years. The apples that are grown in this locality are chiefly fall and winter varieties. The Golden Russet succeeds best on clay loam soil, but Early Harvest, Rhode Island Greening, and the principal fall sorts succeed best on light soils. A gravelly subsoil is best.

[*Lambton.*]

SUMMER APPLES.

Early Harvest and the Red Astrachan are the most profitable varieties of this class. The average price per barrel is about $1.50. The local demand is sufficient to consume all the apples grown in this district.

FALL APPLES.

The Snow and Hawthornden are the most profitable fall apples to the grower. The average price is 75 cents per barrel. The above-mentioned varieties also succeed best as regards hardiness, productiveness, etc. The present supply is equal to the demand.

WINTER APPLES.

Northern Spy, Rhode Island Greening, Baldwin, and the Golden Russet are the varieties of winter apples that are most esteemed in this locality. The Golden Russet, and Rhode Island Greening, succeed best. The Northern Spy, and Baldwin, are most profitable for the home market; they are also most in demand, and command the best prices for export. The Golden Russet and Northern Spy will keep best during the winter.

WINTER KILLING—BORERS—CODLIN WORM.

The average price realized per barrel is $1.75. The Baldwin is rather tender for this district. The blight attacks some of them occasionally. Borers are not very destructive after the trees come into bearing. The borer generally attacks them the second or third year after they are planted out. The codlin worm is not prevalent, and the only remedy for getting rid of these pests is by hand-picking.

PEARS.

Pears can be cultivated in this district, and the soil that is best adapted for their cultivation is clay loam. About two-thirds of the trees now growing are in full bearing. The summer and autumn sorts are most esteemed; but the autumn is the most profitable of the two. The trees succeed best on their own roots as standards. The crop is chiefly consumed in the neighbourhood, and the price realized per bushel is about $1. Good cultivation is the best remedy for blight. The trees are not attacked by borers.

PLUMS.

Plum culture is fairly profitable in this district. Almost any kind of dry soil will suit them. The Green Gage, Yellow Egg, Victoria, Purple Gage, Lawrence's Favourite and Columbia, are the varieties most esteemed for home consumption; but the Yellow Egg, and Victoria, are most profitable to grow for market. What are not used on the farms are generally bought up in the villages. They realize about $1.50 to $2 per bushel at home and abroad. The plum curculio is troublesome, but the trees suffer neither from other insects nor from black knot.

PEACHES.

Peaches are not grown profitably in this district, owing to the low temperature in winter. The Early Crawford variety ripens earliest.

CHERRIES.

Cherries can be profitably grown in this district, and the varieties that succeed best are the Flemish, Morello and May Duke. There are only two or three cherry trees grown on each farm so that there are scarcely any for sale.

GRAPE CULTURE.

Every farm has a few grape-vines; the Clinton, Concord and Delaware are the varieties that succeed best; but the Concord is the most profitable to grow for market. They grow best on a light dry soil with a gravelly subsoil. Grapes are sold for about three cents per pound about here, but are not sold very readily in the villages of this locality. They suffer very often from late spring frosts, but most often from early autumn frosts. The fruit is seldom touched by birds, and the vines and leaves are not injured either by any disease or insects.

RED AND WHITE CURRANTS.

Of red and white currants, the large red is the variety most esteemed in this district. The culture is profitable, and they sell for about three cents per quart. Neither the fruit worm, currant bug, nor the currant borer, do any damages either to the plants or fruit.

BLACK CURRANTS.

Black currants are grown considerably. The common black is most esteemed, and the culture of them is profitable. That portion of the crop that is not consumed at home is always sold in the villages around. Five cents is the usual price realized per quart. The bushes do not suffer from any insect enemies.

GOOSEBERRIES.

Gooseberry growing is not profitable here. Of what are grown the Houghton Seedling is the most esteemed, and they fetch about five cents per quart. They are slightly subject to mildew and sell best when ripe.

WATER AND MUSK MELONS.

Neither water nor musk melons are much grown. The variety most esteemed of those that are grown is the Egyptian Green Flesh. The crop is not a profitable one, and there is not a ready sale of the fruit. They ripen about September, and the best treatment that they can receive is plenty of stable manure and leached ashes. No insects are injurious to them. A light loam is the best soil to grow melons in.

PERTH COUNTY.

FRUIT GROWING IN PERTH.

Apples, pears, plums, cherries, grapes, currants, gooseberries, peaches (a few), strawberries and raspberries are the fruits cultivated in this district. About 75 per cent. are apples, 10 per cent. plums, and about 3 per cent. peaches. About 60 per cent. of the trees are in full bearing. About one-half of these are winter apples.

SUMMER APPLES.

Early Harvest and Red Astrachan are the varieties that are the most profitable of the summer apples. The market is sometimes overstocked with summer apples; the surplus is often lost or fed to pigs.

[*Perth County.*]

FALL APPLES.

Duchess of Oldenburg, Fall Pippin, and St. Lawrence, are the varieties of fall apples that succeed best as to hardiness, productiveness, etc. The present supply of fall apples is more than equal to the demand.

WINTER APPLES.

The varieties most esteemed of the winter apples are the Baldwin, Rhode Island Greening, Pippin, Golden Russet, Northern Spy, Rox Russet, Spitzenberg, and Talman's Sweet. The Baldwin and Rhode Island Greening succeed best in this district. All the varieties are equally profitable for the home market. The Northern Spy, Golden Russet, Rhode Island Greening, and Baldwin, are in most demand, and command the best prices. Spitzenberg, Golden Russet, Northern Spy, Baldwin, Talman's Sweet, and Rhode Island Greening keep best during the winter. The average price realized per barrel is $1.50. Golden Russet, Rox Russet, Baldwin, Rhode Island Greening, and Northern Spy are found most suitable for shipping.

GOOD SEEDLING APPLES—TENDER VARIETIES.

There are many good seedling apples in this district, and this ought to be known, for they are esteemed far before many of our standard varieties. The King of Tomkins County, Baldwin, and Rhode Island Greening have sometimes shown signs of tenderness in severe winters.

HEALTHINESS OF TREES—INSECTS.

The apple trees are not subject to any disease, and the borers are not destructive to them. Tent caterpillars were injurious some years ago, but have not been seen lately. The codlin worm is rather bad sometimes, where too little effort has been made to check them, but perseverance, with broom and gloved hand, has done much to rid the district of these pests.

PEARS.

Many kinds of pears can be successfully grown. They appear to do well on any strong, well-drained soil, but clay loam is preferable. The proportion of pear trees now growing and bearing is not large. Standard pear trees usually begin to bear about five years from planting. The Bartlett, Flemish Beauty, Duchess d'Angouleme, Clapp's Favourite, St. Lawrence, and the Goodale are the varieties most esteemed of the summer, autumn, and winter sorts. The Bartlett, Flemish Beauty, Louise Bonne de Jersey, and Clapp's Favourite are among the most profitable and commonly planted varieties. The crop is chiefly consumed in the neighbourhood. The average price realized per bushel is $1.25.

BLIGHT—PEAR SLUG.

Some of the pear trees are subject to blight in this locality, but no successful plan for remedying this evil has as yet been arrived at. The pear slug, a sort of small snail, at times "skins" the leaves.

PLUMS—LOW PRICES—CURCULIO—BLACK KNOT.

The market is too low to make plum culture profitable. There is little difficulty experienced in raising almost any variety of plums in any quantity desired, but for the ravages

of the curculio. Nothing in this district can be raised with greater ease than plums. The Washington and McLaughlin are the most esteemed, but they are not the most productive. The Lombard is the plum of the people generally, but now all are alike, the curculio attacks all, and, in addition, the black knot attacks the Lombard. The crop grown is too large for the home consumption, and the surplus is shipped to other localities where the crop has been a failure. The price at home is $1 per bushel, or less, but the price abroad is extremely variable. The Lombard carries best. The curculio is very troublesome, but may be kept in subjection by "jarring" the trees or fumigating with burning coal tar. The plum trees are not troubled by any other insect, but suffer from black knot, especially the Blue Plum and Lombard. They are some years injured by rot. There are no good seedling plums in this locality. Robins and a few other birds pick a little at the fruit. Wood ash has been used as a manure with beneficial effects.

PEACHES.

Peaches cannot be profitably cultivated in this locality, and the fruit buds are often injured by the low temperature in the winter.

APRICOTS AND NECTARINES.

Apricots and nectarines are not grown in this locality.

CHERRIES—THE BIRDS.

The cherries can be grown, but the birds take all the best ones before they are ripe. The Early Richmond and May Duke succeed best, and the crop, or what is left of the crop, is consumed at home. The robin, the red-headed woodpecker, and the cherry bird are the ones that devour the fruit. There are no good seedling cherries cultivated in this locality.

GRAPES—SPRING FROSTS.

Grapes are cultivated to a small extent. The Clinton, Concord, Delaware, and the Burnet grape, are the ones that succeed best. The Burnet is especially very promising. The Concord is the most profitable for market. Any well drained and enriched soil will grow the hardy grape. There is a ready demand for all the grapes grown. The price per pound is four cents. The grape crop often suffers from late spring frosts, but not from early autumn, the folige gives protection. The vines are not injured by any disease, and the insects and birds inflict very little damage.

STRAWBERRIES.

Strawberries are not grown extensively in this district, the soil being too heavy. The Wilson is the variety most generally known in this locality. A sort of wasp cuts off and carries away the leaves, and the robins take a few of the strawberries in the gardens.

RASPBERRIES.

Raspberries are a great success, both black and red. Several kinds are grown in gardens. The Philadelphia are most esteemed for amateur growth, and they are also the most profitable for market. Some native varieties are hardy and of good quality. Six to ten cents is the price paid per quart.

RED AND WHITE CURRANTS.

There are very few red and white currants grown. The currant worm can be pre-

vented from devouring the leaves by a sprinkling of hellebore early in the season. The fruit-worm is not common.

BLACK CURRANTS.

The Black Currant is cultivated a little in this locality. English Black and Black Naples are the varieties most esteemed. The culture of this fruit is profitable, and the crop is entirely consumed at home. The average price per quart is 10 cents. There is no appearance of any insect enemies.

GOOSEBERRIES.

Gooseberries are grown with profit here. The Houghton Seedling is the variety most esteemed. Ten cents is the price usually realized per quart. The fruit sells best green. All imported varieties are subject to mildew. Hellebore prevents the currant worm from destroying the leaves. The fruit worm is, in some seasons, troublesome to gooseberry-growers.

WATER AND MUSK MELONS.

Water and musk melons are not grown extensively. Some sort of striped bug injures the vines.

FORESTRY.

Almost 30 per cent. of the land is still in bush, including the Ellice swamp and there is very little, if any, under second-growth. The soil is very good, varying from loam on flat land to clay subsoil, with occasional deposits of gravel. The following are the trees that are common in this district, viz., maple, beech, basswood, elm, ash, hickory, with an occasional butternut, cherry, birch and ironwood.

GOOD DEMAND FOR HARDWOODS.

Hardwoods are much in demand for local use. From fifteen to twenty years ago the oak and elm were shipped to Europe. Oak, ash and elm are chiefly used in the manufacture of agricultural implements. Oak and hickory, and some elm are used for carriage-making.

COMMERCIAL VALUE.

The commerical value of white and black oak is $16 per thousand. There is not much oak remaining uncut.

WIND BREAKS.

Belts of wood serve capitally for wind breaks, which winter wheat requires. Norway Spruce make the best screens for farms and orchards. About twelve years is required to make such a screen effective. The probable cost of screening per hundred feet would be about $4.

EFFECT OF CLEARING ON MOISTURE.

Since the clearing of forests, springs that were continuous are becoming periodical, and the same cause affects the streams.

ENCOURAGEMENT TO TREE PLANTING.

The County, as an encouragement to the farmers, gives a premium of 15 cents per tree for four or five specified kinds of trees that are planted on road sides, and living at the end of three years after planting.

[*Perth County.*]

VALUE OF TIMBERED FARMS.

The difference in the average value of a 100-acre farm, with or without sufficient tree shelter, would be from $500 to $1,000.

A STOCK LAW NEEDED.

The prohibiting of cattle running at large would be the best method of encouraging tree planting.

ELGIN.

FRUIT GROWING IN ELGIN.

Apples, pears, peaches, cherries, strawberries, grapes, raspberries, blackberries, gooseberries, and a few plums and currants are the fruits cultivated in this district. There are seven times more apples, than all the other fruits together, grown. Fully seventy-five per cent. of the trees are in bearing. The proportion of land occupied by strawberries, raspberries, grapes, and other small fruits is very small. There are no large tracts of land occupied by them. The winter varieties of apples are chiefly grown.

SUMMER APPLES.

The Red Astrachan, Sweet Bough, and Early Harvest are the most profitable summer apples. The average price per barrel is from $1 to $1.25. The local demand for summer apples is not large enough to consume them, and they are simply left to rot on the ground, although a few are made into cider.

FALL APPLES.

The Gravenstein, Ohio Nonpareil, Autumn Strawberry, Fall Orange, Maiden's Blush and the Pippin family, are the most profitable of this class. $1 to $1.25 is the average price per barrel. For hardiness, productiveness, etc., the Ohio Nonpareil, Snow Apple, Gravenstein and Pippins succeed best.

WINTER APPLES.

The Baldwin, Rhode Island Greening, Northern Spy, King of Tomkins County, Russet, and the Spitzbergen, are the apples which are most esteemed in this district. All these varieties succeed equally well. The varieties that are most in demand, and command the best prices for export, are the Baldwin, Rhode Island Greening, Spy, and Russet. The varieties that are the most profitable for the home market are the King of Tomkins County, Northern Spy, Spitzbergen and Belleflower. The Rox Russet, Greening, Baldwin, Spy and Talman's Sweet, are the best apples for keeping during the winter. Only a few thousand barrels are shipped elsewhere, the greater bulk being consumed at home. The average price realized per barrel ranges from $1.25 to $1.60.

SEEDLINGS—THE BALDWIN—INSECT AND OTHER PESTS.

There are no good seedling apples cultivated in this locality. The only variety that appears to be too tender for some severe winters is the Baldwin; the others all fare well. None of our apple trees are subject to any disease, such as blight, etc., in this neighbourhood. The borers appear not to do any harm to the apple trees in this district. Tent

caterpillars and other insects only slightly injure the foliage. The codlin worm is very prevalent.

PEARS.

Pears can be grown with fair success in this district. The Bartlett, Flemish Beauty, and Sheldon, are the varieties that are most esteemed here. The crop is all consumed locally. About $1 is the average price realized per bushel.

BLIGHT—INSECTS.

There is scarcely any blight, and there are only a few tree borers. A small black insect attacks the leaves; they curl up and in turn drop off, but the insect does not seem to injure the tree.

PLUMS.

Plum culture is not profitable in the district. The Smith's Orleans, Imperial Gage, and Green Gage, are the varieties most esteemed for home consumption. The varieties that are most profitable to grow for the market are the Pond's Seedling, Yellow Gage, Smith's Orleans, Imperial Gage, and the Green Gage. All the plums that are grown are consumed at home or near home, and if there were any surplus they could be easily sold, at from $1 to $2 per bushel.

THE CURCULIO—BLACK KNOT.

The plum curculio is very troublesome. There are no other insects which seem to attack the plum in this district. The plums do not suffer from black knot, neither are they much injured by rot.

PEACHES—SEEDLINGS—WINTER

Peaches are grown, and they can be profitably cultivated. Seedlings stand the winter well, although the first buds are often injured by the low temperature. The Early Amsden, Early Beatrice and Hale's Early, are the varieties that ripen earliest. Good seedlings are most profitable for market. The local demand is quite sufficient to consume the crop. Large quantities are shipped to the interior districts, St. Thomas being the principal market. They fetch from $1 to $4 per bushel.

THE YELLOWS—CURCULIO—BORERS—ROSE BEETLES.

None of the trees seemed to have suffered much from yellows. The fruit suffers much more from the attacks of the curculio when one peach season comes close after another, as last year and this year. On the whole, they are not very troublesome. The trees are not often injured by the borer, nor troubled much by any other insect except the rose bugs on sandy soils.

APRICOTS AND NECTARINES.

Of this species of fruit, none of any importance are grown.

CHERRIES.

All kinds of cherries can be grown, but the red cherry is the best. The crop is chiefly consumed at home. From three to six cents is the price paid for cherries. The common red is the best variety for market. There are none shipped. The curculio has been very bad this year. The other insects which are very injurious to the trees are the rose bugs, especially on sandy soils. The fruit is not subject to rot, and the birds that are the most destructive to the fruit are the woodpeckers and robins. The trees succeed best

on a sandy loam with a gravelly subsoil. There are no no good seedling cherries in the district.

QUINCES.

There are only a few quinces, and the trees bear pretty regularly.

GRAPES.

Grapes are cultivated to a large extent in this district. The Concord and Clinton are the varieties that succeed best, the Concord being the most profitable to grow for market. A sandy soil is the best soil for their growth. The grapes that are grown are all locally consumed, and they fetch from four to six cents per pound. Grape culture is profitable, although there are almost too many grown for home consumption. The grape crop sometimes suffers from early frosts. If the trellises are built high the grape is more free from frost. The vines are not injured by any disease or rot. The rose bugs on sandy soils do a great deal of damage. The only species of bird that is troublesome is the blue jay.

STRAWBERRIES.

A few strawberries are cultivated in this district. The variety that is most esteemed for home consumption is the Wilson. The Wilson variety carries best. They fetch a price from six to ten cents per quart.

DESTRUCTIVE BIRDS—INSECTS.

The birds that are destructive to the fruit are the robins, canary birds, and the yellow-winged woodpecker. The larvæ of the May bug destroy the plant sometimes.

RASPBERRIES.

There are a few black and red, and some yellow raspberries grown. The Mammoth Cluster is the most esteemed for amateur growth, and the most profitable for market. It fetches from six to eight cents per quart. The insects injure the vines by putting eggs in the canes.

BLACKBERRIES.

Blackberries are not much cultivated.

RED AND WHITE CURRANTS.

Red and white currants are mostly destroyed by borers and worms, and the common varieties are grown. Their culture is not profitable. There is hardly any demand for them. The currant borer is very injurious. The currant worm devours the leaves, but then that is easily remedied. Some farmers have adandoned growing currants owing to these worms. The fruit worm is not very common. There are no other insects that are injurious either to the bushes or fruit.

BLACK CURRANTS.

Black currants are grown considerably. The variety most esteemed is the Black Naples. The culture of this fruit is profitable. The fruit is entirely consumed at home. The usual price realized per quart is ten cents. This currant has no insect enemies.

GOOSEBERRIES.

There are not many gooseberries grown. The variety most esteemed is the Houghton Seedling. The usual price for them is eight cents. The fruit sells best when fully

grown. This variety is not subject to mildew. The currant worm is very destructive to the leaves. The fruit worm that devours the unripe fruit is not a serious difficulty to gooseberry growers. White hellebore is a successful remedy for these evils.

CRANBERRIES.

Cranberries are not cultivated here at all.

WATER AND MUSK MELONS.

There is a small quantity of melons grown. The crop is a profitable one. There has been a ready sale for the fruit. Musk melons are cultivated to a large extent. The green fleshed variety is the most esteemed for the table, and is also the most profitable for the market. They ripen early in September. Water melons ripen in August and September.

FORESTRY.

About one-third of this district is under original bush. The general character of the soil is clay loam. The usual varieties of trees are common, except walnut, of which there is very little. There is but little second growth. The trees are mostly used for mechanical purposes. Hardwoods are slightly in demand for local use and for shipping.

USES OF HARDWOOD.

Red oak, chestnut, walnut, and cherry, are preferred for the internal fittings of buildings. White oak, white ash, and rock maple, are chiefly used with us for the manufacture of agricultural implements and tools. White oak, white ash, hickory, basswood, maple, and whitewood, are used in the manufacture of vehicles. Walnut, cherry, chestnut, maple, basswood, and ash, are used in making furniture. Walnut is to be preferred for this purpose.

COMMERCIAL VALUES—OAK STAVES—RAILWAY TIES.

The commercial value of walnut is $60 per thousand, cherry $20, basswood $14, ash $16, and maple $12. The commercial value of white and black oak timber, respectively, is $16 and $12, per thousand, board measure. Oak staves are much in demand, but oak is too valuable in this locality for that purpose. Oak and tamarack are being chiefly used for railway ties. About 30 cents each, or $40 per hundred, is the price paid for railway ties. The black walnut is nearly all cut.

ENCOURAGEMENT OF TREE PLANTING.

Government aid is the only means for encouraging the planting of forest trees on farms containing portions of land otherwise barren and useless. There has been no experiment in planting trees on hill sides, or other localities. No one has planted any young forests. Walnut, oak, cherry, maple, white ash, basswood, and hickory, should be recommended for general forest planting.

WIND SCREENS.

A highly beneficial effect has been observed from leaving belts of wood to act as screens on farms, especially when they are left on the west side. Maple, spruce, and common pine make the best screens for farms and orchards. Moderate premiums would be a good method of encouraging tree planting throughout the Province.

[*Elgin.*]

NORFOLK.

FRUIT CULTURE IN NORFOLK.

The fruits cultivated in this County are: apples, pears, peaches, cherries, plums, grapes, currants, strawberries, raspberries, gooseberries, quinces, and blackberries.

APPLE CULTURE.

The apple is the principal fruit cultivated, and is grown very largely, and with considerable success.

PEACHES—PLUMS.

With regard to quantity, plums and peaches rank next to apples, and are grown in about equal proportion.

FRUIT CULTURE IN ITS INFANCY.

The cultivation of all fruits, with the exception of the one first named, is, however, as yet in its infancy, as only enough is raised to meet the local demand. About two-thirds of the apple trees of the county are in full bearing.

SUMMER, FALL, AND WINTER APPLES.

The winter varieties are mostly raised, although there is a large quantity of the summer and fall kinds grown, indeed more than is required for the home market, and, as none are exported, great waste occurs, large quantities of the fruit being allowed to rot.

SUMMER AND FALL VARIETIES.

The Early Harvest, Red Astrachan, Keswick Codlin, and Tetofsky, of the summer varieties, and the Duchess of Oldenburg, Colvert, St. Lawrence, Maiden's Blush, Gravenstein, Fall Pippin, Alexander, and Northern Spy, of the fall and winter kinds, are the most profitable, the price obtainable being about $1 per barrel, when sales occur, but very few are sold other than locally.

HARDIEST VARIETIES.

The hardiest varieties and most productive are the Northern Spy, Duchess of Oldenburg, Maiden's Blush, and Gravenstein, and the St. Lawrence, Russet, Rhode Island Greening, Northern Spy, Spitzenberg, and King of Tomkins County, are the best for shipping to other parts of the Dominion and the United States.

SHIPPING VARIETIES—WINTER.

Of the winter kinds, the Spy, Baldwin, Rhode Island Greening, King of Tomkins County, Golden Russet, Swaar, Ribston Pippin, Yellow Belleflower, Belmont, Ben Davis, Dominie, Wagener, and Æsopus Spitzenberg succeed best, and the first-named five varieties command the best prices for export.

BEST WINTER-KEEPING APPLES—EXPORTS—PRICES.

For winter-keeping apples, the Rox Russet, Baldwin, Golden Russet, Northern Spy, Dominie, and Ben Davis are the best. Over three-fourths of the crop of winter apples are shipped, the price obtainable being from $1 to $1.25 per barrel.

[*Norfolk.*]

WINTER KILLING.

During one year only has the winter proved too severe, that of 1875, when in the municipality of Houghton, some trees of the Baldwin, Wagener, and Colvert varieties were killed with frost. This, however, is an exceptional case, as during no other year has a similar experience been recorded.

BLIGHT—BORER—CATERPILLAR—CODLIN WORM.

The ends of the branches are sometimes blighted, but the other parts of the trees have so far escaped. The borers are not very destructive in any of the townships, with the exception of Houghton, where they are rather troublesome. Of the other destructive insects, the tent caterpillar occasionally gives trouble, as also does the codlin worm, which in some municipalities is very prevalent, but, on the whole, the work of destruction by these insects seems to be abating.

REMEDIES FOR INSECT PESTS.

The remedies used to rid the country of these pests appear to be very meagre, and consist of scraping the bark of the trees during the winter, and of feeding the fallen worm-eaten fruit to the pigs.

PEAR CULTURE.

But few pears are grown, although it is stated they could be grown with success. The trees generally begin to bear at from three to ten years after planting, according to variety.

SUMMER AND FALL VARIETIES.

The summer varieties are Beurre Giffard, Doyenne d'Ete, Bartlett, and Clapp's Favourite, and those of the fall—Flemish Beauty, Louise Bonne de Jersey, Beurre Clairgeau, Duchess d'Angouleme, Belle Lucrative, Buffam, Winter Doyenne, Howell, Seckel, Sheldon, Winter Lawrence, Vicar of Winkfield, Winter Nelis, and Beurre d'Anjou.

MOST PROFITABLE KINDS.

The Bartlett, Flemish Beauty, Beurre Clairgeau, and Louise Bonne de Jersey, are the most profitable varieties.

PRICES OBTAINED.

The crop is nearly all consumed at home, the price ranging from $1 to $3 per bushel.

PEAR BLIGHT.

Although almost entirely free from borers, the trees are a good deal subject to blight. Linseed oil has been used by some, but severe cutting is the remedy for blight generally resorted to.

PLUM CULTURE—MOST PROFITABLE VARIETIES.

The culture of plums is being gradually abandoned. The best varieties for home use are, Green Gage, Smith's Orleans, Lombard, Egg Plum, Blue Damson, and Pond's Seedling, and the Green Gage and Lombard for the market. The price paid ranges from $1 to $1.50 per bushel.

[*Norfolk.*]

CURCULIO AND BORER.

The curculio is exceedingly troublesome, and the borers give some annoyance both to plum and peach cultivation.

PEACH CULTURE—SUCCESS OF PEACH-GROWING.

Peaches are grown extensively, and are very profitable generally. The trees stand the winter well, being seldom injured by the severity of the weather. The earliest ripeners are Beatrice, Alexander, Amsden's, June, and Hale's Early, and those most profitable for the market are Crawford's and Hale's Early.

SEEDLING PEACHES.

There are quite a number of good seedling peaches.

APRICOTS AND NECTARINES.

The above fruits would do well but for the curculio, to the attacks of which they are extremely liable.

CHERRIES.

Cherry culture is carried on upon a very small scale, only sufficient being grown to meet the local demand, owing to the want of a market wherein to dispose of the surplus fruit.

BEST KINDS—PRICES.

The varieties that succeed best are the Black Heart, Black Tartarian, Napoleon Bigarreau, Yellow Spanish, Coe's Transparent, May Duke, Elton, Governor Wood, and Common Red. From three cents to four cents per quart is the price paid when any sales have been made.

ATTACKS OF CURCULIO AND BIRDS.

The cherry suffers from the attacks of the curculio to some extent, and the robin, cedar bird, and cat bird, also destroy large quantities of the fruit.

QUINCE.

There are over two hundred trees in the county, all of which bear fruit very regularly. The Apple and Orange Quince are the varieties which succeed best. There is, however, very little demand for them.

GRAPES.

Grape culture is in its infancy in the county, very few having vines old enough to bear fruit. The Concord, Hartford Prolific, Salem, Delaware, and Clinton, seem to succeed best. The robin is the only enemy the grape seems to have, but he only inflicts slight damage.

STRAWBERRIES.

In two districts at least, strawberry culture is carried on extensively. Wilson's Albany, New Dominion, Downing, and Hovey's Seedling being the most successful kinds, and commanding a price of from four cents to five cents per quart.

[*Norfolk.*]

RASPBERRIES.

The most successful cultivated varieties are, the Mammoth Cluster, Hallan Cluster, Native Blackcaps, and English Red, Clarke, Philadelphia, Franconia, and Herstone. Price ranges from six to eight cents per quart. There are no insect pests attacking this fruit.

BLACKBERRIES.

The Early Wilson, Davison's Thornless, and Kittatinny are the hardiest kinds. They bear regular crops, and command from seven cents to eight cents per quart, when sales are made. No insects injure this fruit.

RED AND WHITE CURRANTS.

Red and white currant growing is carried on rather largely and with some success, both as to the quantity raised and the profits made by their sale, there being a good local demand for the Versailles, Red Cherry, Red Dutch, and White Grape varieties. The price paid is from eight cents to ten cents per quart. The currant borer is rather troublesome.

BLACK CURRANTS.

The black currant is not cultivated very largely. The best kind is the Black Naples, which is grown to meet the local demand. The black currants are almost entirely free from insect pests.

GOOSEBERRIES.

This fruit is not grown to any extent. Houghton's, Smith's, and Downing's are chiefly raised, but no profit has been made by their culture. The currant worm is very destructive. Hellebore is the only remedy resorted to for its destruction.

MELONS.

Water and musk melons are cultivated to some extent; the Mountain Sweet, Long Island, and Ice Cream being the varieties most esteemed. The Nutmeg and Greenflesh are the most profitable kinds for the market. The melon does best on a sandy loam.

DESTRUCTIVE BIRDS.

The robin, cedar bird, and woodpecker destroy large quantities of fruit, and the blackbird creates havoc among the grain fields.

STANDING TIMBER.

The standing timber generally consists of pine, oak, ash, walnut, butternut, cherry, chestnut, elm, hickory, maple, beech, basswood, birch, larch, and willow. Pine, oak, ash, walnut, and butternut are generally sawn into lumber and shipped, to be used for various purposes. A very small portion of the county is under original forest. The trees best adapted for screens are the Norway spruce and Arbor Vitæ, but very little attention is paid to the sheltering of the orchards and gardens, or crops generally.

[Norfolk.]

UNITED COUNTIES OF DUNDAS, STORMONT, AND GLENGARRY.

FRUITS OF THE DISTRICT.

The fruits that are cultivated in this district are, apples, plums, cherries, grapes, strawberries, currants, gooseberries, cranberries, tomatoes, raspberries, blackberries, brambleberries, and melons.

APPLES THE CHIEF FRUIT PRODUCT.

Of these the chief proportion are apples. Sufficient plums only for local consumption are cultivated. Not one-fourth of the fruit trees are in full bearing.

MATURITY OF APPLE TREES.

Apple trees usually begin to bear plentifully at seven or eight years from the grafting or budding, or four or five years from transplanting. But much depends upon the nature and quality of soil, culture of soil and trees, pruning, variety of fruits, etc.

SMALL FRUITS.

Small fruits are only grown here in gardens. In a few cases grapes and strawberries are grown for market. In one case two acres are in strawberries.

EXTENT OF APPLE CULTIVATION.

The exact quantity of apples that are produced is difficult to estimate. A large proportion of the farmers, etc., raise sufficient for their own use. Some farmers (a few) raise from 100 to 500 bushels. The production is increasing. The fall and summer varieties are the most generally grown. A southern aspect (sheltered from the north and north-west) is regarded in this district as most favourable, because the winters are steady, rather severe, and not given to thawing as in western Ontario, where perhaps a northern aspect would suit better. The distances at which the various descriptions of fruit trees should be planted depends a great deal upon the planter's object. If he intends to use stimulating culture (which means a shorter life for the tree), to attain quick returns, he will plant twenty feet apart each way, or, if his rows run north and south, eighteen feet apart, and trees twenty-two feet apart in row (to attain maximum of sunlight). In large orchards standard trees should be planted thirty feet apart every way The distance should vary in different soils.

MOST PROFITABLE SUMMER VARIETIES.

The most profitable sorts of summer apples are, the Red Astrachan, Early Harvest, and Tetofsky.

PRICES—LOCAL DEMAND.

The average price of apples per barrel is from $2 to $3. The local demand is sufficient to consume all the summer apples grown in our neighbourhood.

FALL APPLES—PRICES.

The most profitable varieties of the fall apples to the grower are the St. Lawrence, Duchess of Oldenburg, and Alexander. The average price realized per barrel is $2. The Duchess of Oldenburg is very hardy and productive; the Alexander is very hardy;

the St. Lawrence is less hardy, but does well. The present supply of fall apples is about equal to the demand.

WINTER APPLES—MOST ESTEEMED VARIETIES.

The Fameuse, Swayzie Pomme Grise, Talman's Sweet, American Golden Russet, Red Canada, Spitzenberg, Northern Spy, and Yellow Pippin are the most esteemed varieties of winter apples grown in this district.

MOST SUCCESSFUL SORTS.

The Fameuse, Talman's Sweet, Swayzie Pomme Grise, and American Golden Russet are the varieties that succeed best. The Fameuse or Snow apples grown here and towards Montreal are much larger and finer than those seen in the western counties.

BEST FOR LOCAL DEMAND.

The varieties that are most profitable for the home market are the Fameuse, Talman's Sweet, Swayzie Pomme Grise, American Golden Russet, and Brockville Beauty.

BEST KEEPING SORTS—MODE OF KEEPING—PRICES.

The varieties that keep best during the winter are the American Golden Russet, Northern Spy, Spitzenberg, etc. The best means for their preservation are, to exclude change of air, pack in sawdust or bran, or wrap in paper, and keep them in a cool place and even temperature. The average price realized for winter apples per barrel is from $2 to $3.

VALUABLE SEEDLINGS.

There were quite a number of good seedling apples, exceedingly valuable, cultivated in this district up to March, 1863, when they were lost by a thaw and following cold snap. There should be some good ones still existing if they were looked up. The soil and climate here are very favourable to the production of good new varieties if experiments were made. One of those lost in 1863 was an autumn apple of the size of a Golden Russet (American), and a perfect apple in shape, texture, colour of flesh and skin, aroma, etc.

ACCLIMATIZATION OF APPLE TREES.

Fifty per cent. or upwards of the so-called standard varieties have proved too tender for our district, but a good deal depends upon location, soil, etc. It is important to get young trees from northern nurseries. A variety from a Montreal nursery will thrive here when the same variety from Rochester would not.

BLIGHT—BORERS—CATERPILLARS—CODLIN WORM.

Apple trees are not subject to disease, such as blight, to any great extent, and only when imported by means of grafted trees from western nurseries. Borers are not very destructive to them. Caterpillars and other insects do not injure the foliage of our trees to a serious extent. The codlin worm is not very prevalent in the fruit in our district at present, but is on the increase. No particular remedies have been so far required to get rid of any of these pests. Tearing caterpillars' nests from the trees with a pole has been sufficient.

PEARS—LIMITS TO PEAR CULTURE.

Pears can only be successfully cultivated to a certain extent. They have been cultivated as far as Montreal; can be grown in sheltered situations on a dry subsoil of excel-

lent quality, but on a limited scale. A strong friable loamy clay, or gravelly soil with warm dry subsoil, is found most suitable for their growth. The Flemish beauty only has been tried here.

PLUMS.

At one time plum culture would have been profitable, but not so much so now on account of the curculio. The adaptability of the soil varies with the variety, but generally a rich loam, and particularly a deep, rich loam, on a clay subsoil, is best adapted to their growth. The plum curculio is troublesome, but the plum trees of this section do not suffer much from black knot, nor are they injured by rot.

SEEDLING PLUMS.

Seedling plums should exist or be produced, as the plum grows wild everywhere in the district.

PEACHES.

Peaches are scarcely grown in the district. They cannot be profitably cultivated as the trees do not stand the winter well.

CHERRIES.

Cherries are not profitably cultivated, but, as the black cherry is indigenous to the district, its cultivation ought to be practicable. There has not been sufficient experimenting to show what varieties will succeed best.

CURCULIO—BIRDS—ROT.

The curculio does not injure the fruit to any extent, nor is the fruit subject to rot. Blackbirds and robins particularly are the species of birds that are most destructive to the fruit.

SOIL.

The trees succeed best on a warm, loamy (rich), porous soil, with an admixture of sand, red earth, or gravel.

SEEDLING CHERRIES.

No good seedling cherries are cultivated here, but the native black is often large and sweet, and could be made the basis of good varieties.

GRAPE CULTURE—VARIETIES.

Many people cultivate grapes in their gardens. Their cultivation may be said to have begun twenty years ago, and increases each year. The Clinton, Delaware, Adirondac, Isabella, Concord, and Salem, are the varieties that succeed best.

THE WILD GRAPE.

Native wild grapes, some of excellent form and quality, grow everywhere throughout these counties, and on the St. Lawrence islands on the dry limestone gravelly hills and ridges, the soil being deep and strong. On the edge of a large marsh, where the vegetable soil was deep and rich, a fine vine (native), heavily laden with splendid clusters of a grape, at least equal to the Clinton in size of bunch and berry flavour, has been seen by the writer of these notes.

[*Dundas, Stormont, and Glengarry.*]

SUPPLY—MARKET—PRICES—FROSTS.

The present supply of grapes is not equal to the local demand; if there were a surplus Montreal would furnish a market. The fruit is usually sold at from ten to fifteen cents per pound. The culture of grapes could be made profitable. The grape crop does not suffer much from the winter frosts, but sometimes from the autumn frosts. So far the vines have not been injured either in root or leaves.

STRAWBERRIES—VARIETIES.

Strawberries are cultivated in the gardens for private use, but very little for the market. The varieties that are most esteemed for home consumption are the Jucunda, Agriculturist, Triomphe de Gand, and some others. The Wilson is the most profitable to grow for market. They have been known to yield in a favourable season 8,000 quarts per acre. They are sold at from eight to fifteen cents per quart.

BIRDS—INSECTS.

The birds that are most destructive to the strawberries are the crow, blackbird, and robin. There are no injurious insects which seriously damage the crops.

BLACKBERRIES.

Fine natives grow in abundance on the newer soils.

RED AND WHITE CURRANTS.

The culture of the red and white currant is profitable for home use. Fairly rich loam, moderately warm and dry, is most suitable for their cultivation. The currant borer which bores into the stem is not very injurious. Latterly the currant worm has inflicted some damage on the plant. The fruit worm is not common. There are no other insects that are injurious either to the fruit or the bushes.

BLACK CURRANTS.

Black currants are only grown for home use, although the culture of this fruit should be profitable. The fruit that is produced is entirely consumed at home. Rich loamy soil, moderately warm and dry, is best adapted to the growth of this fruit. The bushes do not suffer from any insect enemies.

GOOSEBERRIES.

Gooseberries are not grown to any extent.

CRANBERRIES.

Cranberries are not much cultivated. Facilities for flooding, etc., don't exist in these counties. There are very large cranberry swamps in some of the townships. They grow wild in Winchester, Mountain and Roxborough Townships to some extent.

WATER AND MUSK MELONS.

Water melons are cultivated to a limited extent. Musk melons are also grown on a small scale. Their time of ripening depends upon the season somewhat, but generally they ripen from the 15th to the 30th September.

THE TIMBER OF THE DISTRICT.

About 50 per cent. of the district is under original bush, and 10 per cent. under second growth. The general character of the timber is hardwood on limestone (gravel or loamy gravel) hills and ridges, and soft woods and evergreens on lower flat lands with clay subsoil.

THE MOST COMMON WOODS.

The following trees are common in the district: white oak; elm; white, yellow, and black ash; hickory, butternut, maple, beech, basswood, birch, sumach, ironwood, willows of all kinds, and some black cherry; also white pine, tamarack, spruce, balsam, cedar and poplars.

SECOND GROWTH TIMBER.

There are, no doubt, second growth trees here; ten, twenty, thirty, forty, fifty, etc., years old, as the country was first settled ninety odd years ago. Hard and soft maples, elms, ash, poplars, pines, willows, butternuts, and also spruce, grow rapidly.

OAK—ELM—HICKORY—BUTTERNUT.

Oak is used for carriage making, etc.; elm for carriage making and for fuel; ash for frame timber, house-finishing, furniture, etc.; hickory for carriage making, axe-handles, etc.; butternut for house-finishing and furniture.

CHERRY—MAPLE—BEECH—BASSWOOD—BIRCH.

Cherry is used for furniture; soft maple for house-flooring and fuel; hard maple for fuel and furniture; beech for fuel; basswood for lumber, etc.; and birch for fuel and stair-railings, etc. There are a few other trees that are not enumerated in the above list which grow with us and which are used for some particular purpose, namely: pine, spruce, tamarac, balsam, cedar, poplar, black oak, rock elm, and hemlock.

WASTE OF HARDWOODS.

Hardwoods are not much in demand, but they should be. A great deal of really valuable timber is wasted.

USES OF ASH, OAK, ELM, HICKORY.

Ash is used considerably, and is the only hardwood which is in demand for the internal fittings of buildings, and is preferred above all other sorts. Oak, ash, elm and hickory, are used for the manufacture of agricultural implements and tools. Oak, basswood, hickory, ash and elm, are used in the manufacture of vehicles. Hard maple, ash, butternut, oak and basswood, are used in the making of furniture. Hard maple, ash, and oak, are of the most value for the above purpose.

VALUE—AGE—VARIETIES USED.

The commercial value of maple, ash and basswood, would be about $15 per thousand; of butternut $20, and of oak $30. White ash is merchantable at any age; oak from thirty years upwards; and maple, basswood and butternut, at forty years. Poplar is used for the manufacture of paper. Soft wood is sold at $2 to $3 per cord. Elm, ash, and soft maple are used for the making of charcoal. There is not more than sufficient oak, remaining uncut, for local use. White oak was once plentiful and large here, and of extra

[*Dundas, Stormont and Glengarry.*]

good quality. Oak staves are not much in demand. Hemlock, ash, tamarack, elm and cedar are being chiefly used for railway ties. $20 to $30 per hundred is the price paid for these.

BLACK WALNUT CULTIVABLE.

There is not much black walnut growing in our district. It does not appear to be a native, but it has been proved by actual experiment that it will thrive here.

MATURITY OF BLACK WALNUT.

The walnut, in regard to growth, is about equal to the butternut, and is fit for some purposes at forty years of age.

TREES FOR REPLANTING.

Hard maple, soft maple, elm, white pine, spruce, cedar, popl.. (if required for paper making), oak, hickory, butternut and black walnut, are the trees that should be recommended for forest planting.

TREES FOR HILL SIDES.

Sugar maple, oak, hickory, butternut, walnut, cherry, should be planted on hill sides in this district. White pine, if the hills are sandy, and ash, soft maple and elm, on low lands.

ENCOURAGEMENT OF TREE PLANTING.

Premiums given by the municipalities (township) would encourage persons to go in for forest tree planting. No one in this neighbourhood has planted any young forests on a large scale. But planting on streets, along fences and roads, etc., and the thinning, etc., of second growth woods shows the thing can be done as well as the growing of grain crops. For example, the seed of the sugar maple has been gathered in autumn, kept in a paper parcel (as in the case of garden seeds, grains, etc.) over winter, and sown in the spring with perfect success. Hard maple, soft maple, ash, elm, pine, beech, birch, oak, hickory, butternut, walnut, spruce, etc., are recommended for general forest planting.

GATHERING THE SEEDS OF FOREST TREES.

Farmers could best raise the trees themselves by gathering the seeds in their own localities, etc. The seeds of forest trees, such as soft maple, elm, ash, should be gathered in the spring for sowing; gather the hard maple in the fall, and sow it in the spring; nuts, gather and plant in the fall, etc.

WIND BELTS—SCREENS—GOOD RESULTS.

The following beneficial effects have been observed to result from leaving belts of wood to act as screens on farms. It equalizes the temperature, protects from searching, frosty winds in winter; protects winter grain; protects orchards in both winter and summer, and helps to equalize the rain-fall. For a quick and early screen use sumach, willow, soft maple, elm, etc. For a permanent one use spruce, pine, white cedar, balsam, intermixed with maple, elm, ash, etc. Sumach and yellow willow may be made effective for a summer screen in three or four years. Soft maple, if transplanted large, in six years, etc. The probable cost, per hundred feet, would depend upon the breadth of belt, etc. Maples, elms, ash, oak, butternut, cherries, pines, and cedars, are best adapted for planting around fields and on public roads. The basswood is one of our prettiest trees, although the limbs get broken by sleet.

[*Dundas, Stormont and Glengarry.*]

CLIMATIC CHANGES.

There has been a most decided change in climate, rainfall, snow, springs of water, drought, etc., from the clearance of the forest. The rain-fall is less and less uniformly diffused, springs fail in many cases, and drought is more frequent since the clearance of the country. The climate tends to become more extreme in heat and cold in summer and winter, through the clearance of the forests.

MEANS OF ENCOURAGING TREE PLANTING.

Exemption of the planted land from assessment and taxation for a given number of years (say fifteen), upon a certificate of the road superintendent, that the planting was satisfactory, etc.; the diffusion of knowledge of the benefits to be derived from tree planting; a good example on the part of the Provincial Government by their limiting the use and waste of the public timber domain, that is, limiting the yearly production of square timber and logs in the Province; and passing stringent laws against setting out fires in the pine regions, and having overseers for this, would be the best means probably of encouraging the preservation and cultivation of timber.

OXFORD COUNTY.

FRUIT GROWING.

Apples, plums, pears, peaches, quinces, cherries, small fruits of all kinds, and grapes in small quantities, are the fruits that are grown in this locality. The greater proportion of these are apples. About one-half of the trees are in full bearing, and they usually begin to bear from ten to fifteen years after planting. A very small proportion of the land is occupied by strawberries, raspberries, and other small fruits. Last year there were from ten to twelve thousand bushels of apples produced in this locality. All kinds of apples grow in this district.

SUMMER APPLES.

Of this sort the Early Harvest and Red Astrachan are the most profitable. The average price per barrel is from $1.00 to $1.25. The local demand for apples is not sufficient, and they are left to rot in the orchards.

FALL APPLES.

The St. Lawrence, Snow, Gravenstein, Fall Pippin, and the Duchess of Oldenburg are the varieties of this class that are most profitable to the grower. The average price realized per barrel is $1.00. The varieties that succeed best as to hardiness, productiveness, etc., are the Snow, St. Lawrence, Duchess of Oldenburg, Gravenstein, and Fall Pippin. The supply, in excess of the local markets, is shipped to eastern markets. The Snow apple and Fall Pippin have been found most suitable for shipping.

WINTER APPLES.

The Northern Spy, Baldwin, Golden Russet, Spitzenberg, Rhode Island Greening, and Talman's Sweet, are the varieties of winter apples that are most esteemed in this district.

MOST SUCCESSFUL SORTS.

The Spy, Baldwin, Russet, Spitzenberg, and Rhode Island Greening succeed best. [*Oxford County.*]

The Spy, Baldwin, Rhode Island Greening, and King of Tomkins County are most profitable for the home market. The varieties that are most in demand, and that command the best prices for export, are the Spy, Baldwin, Greening, Snow, Russet and Red Canada.

BEST WINTERERS—MARKETS—PRICE.

The Spy, Greening, Snow, and Russet keep best during the winter, and the best mode of keeping them is to pack them in small cheese cases and place them in a dry cold place. About three-fourths of the crop is consumed at home, and the rest is shipped to eastern markets. From $1.00 to $1.50 is the average price per barrel. None of the standard varieties have proved too tender for the district. The apple trees are subject to a blight which does considerable damage every year. Borers are not destructive to them, but the codlin worm and tent caterpillars have been very bad for the last few years.

PEARS.

Pears can be successfully cultivated in this district, the sandy loam soil being most suitable for their growth. About one-half of the trees now growing are bearing. Standard pear trees begin to bear in from seven to ten years. The Bartlett, Flemish Beauty, Vicar of Winkfield, Clapp's Favourite, and Duchess d'Angouleme, are the varieties most esteemed for summer and winter.

PLUMS.

Plum culture is not profitable in this neighbourhood, the fruit being very often destroyed by the curculio. The Green Gage and Lombard are the varieties that are most esteemed for home consumption. The Green Gage and Lombard are the sorts that carry best in long distances.

PEACHES.

There are some peaches grown. The Early Crawford is the variety most esteemed, but Hale's Early ripens earliest.

CHERRIES.

Every variety of cherry can be grown in this neighbourhood. The crop is chiefly consumed at home. Common cherries fetch from $1 to $1.50 per bushel; choice varieties from $2 to $3 per bushel. The Early Richmond, Yellow Heart, and Black Eagle, are the best market sorts, and the Black Eagle and Yellow Heart carry well in crates with shallow trays when shipped. The robin, blackbird, and cherry bird are the chief pests to the cherry. A light soil suits them best.

QUINCES.

Quinces are grown successfully in this district, and the Orange Quince succeeds best. The trees bear regular crops, and there is a good demand, the fruit fetching from $2.50 to $3 per bushel.

GRAPES.

Grapes are only grown in small quantities. Those most esteemed and which succeed best are the Salem, Delaware, Concord and a few other early varieties. There is a fair demand for them, and they fetch from eight to ten cents per pound.

RED AND WHITE CURRANTS.

The Cherry currant is the variety most esteemed in this district, and their culture is profitable. There is a sufficient demand to meet the supply and they fetch from 5 to

8 cents per quart. Currant worms, which devour the leaves, are very numerous, but, with the use of hellebore, they are easily managed. There is a small spider that injures the fruit sometimes, but not to any great extent.

BLACK CURRANTS.

Of this class the Black Naples variety is most esteemed, but they are not grown to any extent. The crop is consumed at home. They bring about 12½ cents per quart.

GOOSEBERRIES.

Gooseberries are grown with profit in this locality. The varieties most esteemed are the Houghton Seedling and the Downing Seedling. From 8 to 10 cents is the price realized per quart. The fruit sells best green. The currant worm is rather troublesome, but the use of hellebore soon settles it. The fruit grows best on a moderately light soil, and there should be a distance of six to ten feet between the rows, and about three feet between the bushes.

FORESTRY.

About one-tenth of this district is under original bush. There is none under second growth.

WOODS OF THE DISTRICT—THEIR USES.

Oak, elm, ash, butternut, cherry, maple, beech, basswood, birch, and ironwood are common in this district. There is some maple in this locality which is being shipped for the manufacture of paper. The hardwoods, such as oak and rock elm, have mostly been cut and shipped for ship-building. Cherry, white ash, and maple are used for the internal fittings of buildings. Rock elm, maple, and oak are chiefly used for the manufacture of agricultural implements and tools. Maple and hickory are used for running gears, and basswood and pine for bodies of the vehicles. Soft elm, maple, basswood, black walnut, and cherry are chiefly used for making furniture. Maple and black walnut are of most value for this purpose.

COMMERCIAL VALUE.

The commercial value of the different sorts of lumber for the above purposes is: maple, $14 per thousand; black walnut, $40 to $50 per thousand; soft elm, $12 per thousand; cherry, $22 per thousand; and basswood, $14 per thousand. Trees are usually merchantable at about from forty to fifty years, some a little sooner; such as black walnut, from twenty-five to thirty years. Poplar and basswood are the varieties of soft woods that are being used for the manufacture of paper. Poplar in this section has been cut short—from three feet four inches to five feet four inches. The price of the first is $4 per cord, the latter $7 per cord. Maple makes good flooring, or scantling for any kind of building. Maple, beech, and ironwood are best adapted for the making of charcoal. Black oak is worth about $18 per thousand. Oak, black ash, and tamarack are being chiefly used for railway ties. The wood should be merchantable at from twenty-five to thirty years.

[*Oxford County.*]

COUNTY OF MIDDLESEX.

FRUIT CULTURE.

The varieties of fruit grown in the above county include all kinds grown in Ontario, with the exception of peaches, apricots, nectarines, and quinces. The district being one of the most favoured in the Province, the yield is very abundant.

APPLES.

Fully three-fourths of the total yield of all the fruit raised are apples, chiefly the winter varieties, which are grown in very large quantities; there are, however, large quantities of summer and fall apples raised, all of which are placed on the market at exceedingly low rates. Apple trees do well on any soil in the county on which potatoes or corn can be grown to advantage.

SUMMER AND FALL APPLES.

The varieties of summer apples that are most profitable are, Red Astrachan, Early Harvest, and Keswick Codlin; and of the fall kinds, Duchess of Oldenburg, Gravenstein, and Fameuse, which is here classed as a fall fruit. There is generally a larger amount raised of both varieties than can be locally consumed, and the surplus fruit is shipped to different sections of the country to be dried or made into cider.

WINTER APPLES.

Of the winter varieties, the Northern Spy, Rhode Island Greening, Baldwin, Grimes' Golden, King of Tomkins County, American Golden Russet, Spitzenberg, Swayzie Pomme Grise are most esteemed, and succeed best; they keep well, provided they are carefully picked, without being bruised, and placed in a cool cellar where the temperature is uniformly within a few degrees of freezing point. The trees, when they receive proper attention, are almost entirely free from insect pests and disease.

PEARS.

This fruit is raised to a considerable extent, large numbers of trees being planted, but for several successive years the yield has not been very good. The varieties most esteemed are as follows: of summer kinds, Bartlett, Tyson, Clapp's Favourite, Elliott's Early, Rostierzer; of the autumn, the Flemish Beauty, Beurre d'Anjou, Beurre Clairgeau, Beurre Superfine, Beurre Hardy, Duchess d'Angouleme, Louise Bonne de Jersey, Seckel, Sheldon, Belle Lucrative and of the winter varieties, Lawrence, Winter Nelis, and Mount Vernon. Nearly all the pear crop is consumed in the neighbourhood. The pear trees are in some seasons much subject to blight, and the only remedy resorted to is the cutting away of the affected part down to the sound wood. The flat-headed apple borer sometimes attacks them, but generally confines itself to the trunk of the tree. The most destructive insect to the leaves is the pear tree slug.

PLUMS.

Plum culture is profitable. The trees succeed well on any good soil, providing it is dry. The varieties most esteemed for home consumption are, Bradshaw, McLaughlin, Washington, Huling's Superb, Green Gage, General Hand, Lawrence's Favourite; and those most profitable for cultivation are, the Lombard, Bradshaw, Pond's Seedling, Yellow Egg, and Imperial Gage. The three last-named varieties carry best when shipped, but must be picked before they are fully ripe, in order to do so. The trees suffer very much at times from black-knot, and in damp seasons from rot.

[*County of Middlesex.*]

PEACHES, APRICOTS, AND NECTARINES.

These fruits are not extensively raised, as they cannot generally be made profitable.

CHERRIES.

The Early Richmond, May Duke, and Common Kentish succeed best, and are raised in sufficient quantities to meet the local demand. The slug and tent caterpillars attack the cherry, and the curculio sometimes is very troublesome and destructive. The robin and cherry bird consume nearly all the early cherries and a large portion of the late ones.

GRAPES.

Grape culture is carried on to a considerable extent, the Concord, Delaware, Crevelling, Agawam, Wilder, Canada, Martha. The most profitable to grow for the market are the Concord, Delaware, and Wilder. All the grapes that can be raised are consumed in the home market, and large quantities are imported besides. The robin is very destructive to the fruit.

STRAWBERRIES

Are largely cultivated; the Wilson, Sharpless, Col. Cheney, Triomphe de Gand, being the kinds most esteemed for home consumption. The Wilson is considered the most profitable to grow for the market, and also carries best. Robins destroy a small quantity of the fruit.

RASPBERRIES.

The Philadelphia, Clarke, Mammoth Cluster, are the varieties most esteemed for market cultivation; for amateur growth, Brinckle's Orange, Franconia, and Brandy-wine.

BLACKBERRIES.

Blackberries are not cultivated to any extent, the crop being, as a rule, very uncertain, and none of the varieties being very hardy.

CURRANTS.

The Victoria, Versailles, Cherry, Red Dutch, and White Grape are the most esteemed of the red and white varieties; and the Black Naples of the black kind. The fruit finds a ready market, the price obtainable being about 10 cents per quart.

GOOSEBERRIES.

Gooseberries are grown with profit and success in this county; Houghton's Seedling and Downing's Seedling being the most esteemed varieties.

FORESTRY.

All the common woods of the country, with the exception of birch and walnut, are common in this district.

[*County of Middlesex.*]

INSECTS INJURIOUS TO THE

SQUASH.

Squash Bug (Coreis tristis).

Larva of Squash Vine Borer.

Squash Vine Borer.

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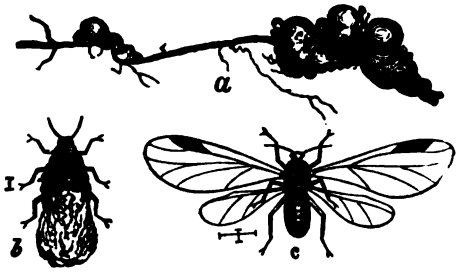
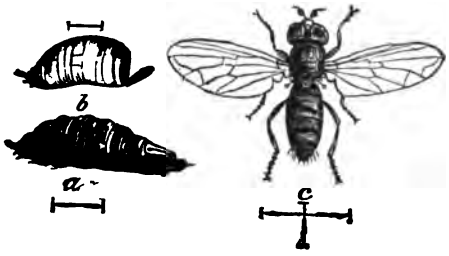
INSECTS INJURIOUS TO THE

APPLE.

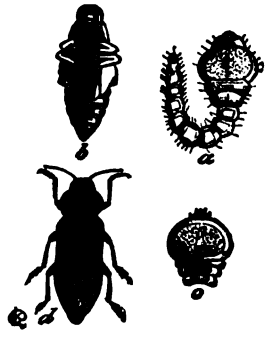


Galls—the work of the Root Plant-louse (Eriosoma pyri), and the perfect winged insect (magnified). *a*, Galls; *b* and *c*, perfect insects (magnified).



The Syrphus Fly (Pipiza Radicum) the enemy of the Plant-louse. *a*, Larva; *b*, chrysalis; *c*, perfect insect, (all magnified).

The Striped Borer (Saperda candida)—*a*, larva or grub; *b*, chrysalis; and *c*, perfect beetle.



Flat-headed Apple Tree Borer (Chrysobothris femorata)—*a*, larva; *b*, chrysalis; and *d*, perfect insect.

Bark of a twig covered with scales containing the eggs of the Oyster-shell Bark-louse (Aspidiotus conchiformis.)

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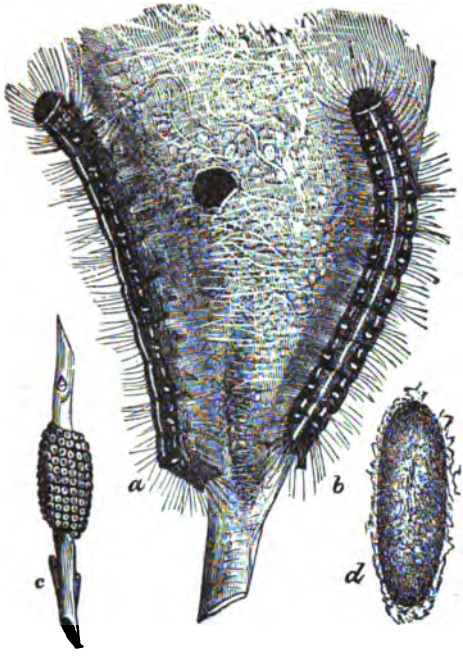
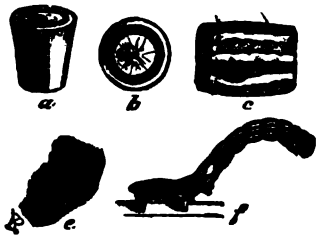


Tent Caterpillar (Clisiocampa Americana)—with cocoon and eggs. *a* and *b*, caterpillars feeding; *d*, cocoon; *c*, one of the egg masses.

Larva of Forest Tent Caterpillar.

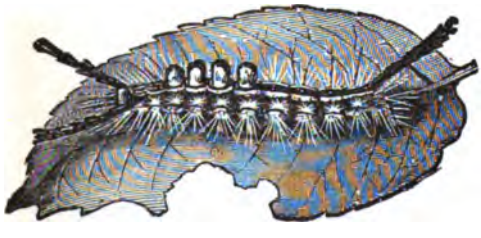
Larva and eggs of the Canker Worm (spring species.)

Moths, male and female, of the Canker Worm (spring species.)

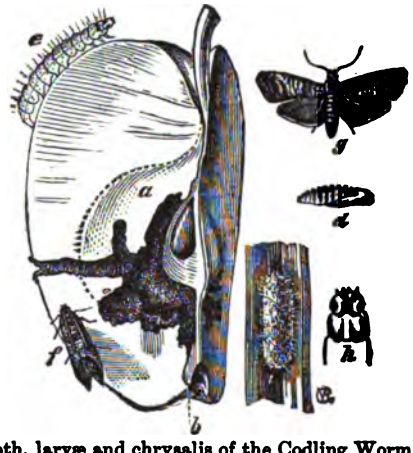


Larva and eggs of the Canker Worm (autumn species.)

Moths of the Canker Worm (autumn species.)



Larva of the white-marked Tussock Moth (Orgyia leucostigma.)



Moth, larvæ and chrysalis of the Codling Worm (Carpocapsa pomonella.) *f* and *g*, moth with wings closed and expanded; *e*, larva; *d*, chrysalis.

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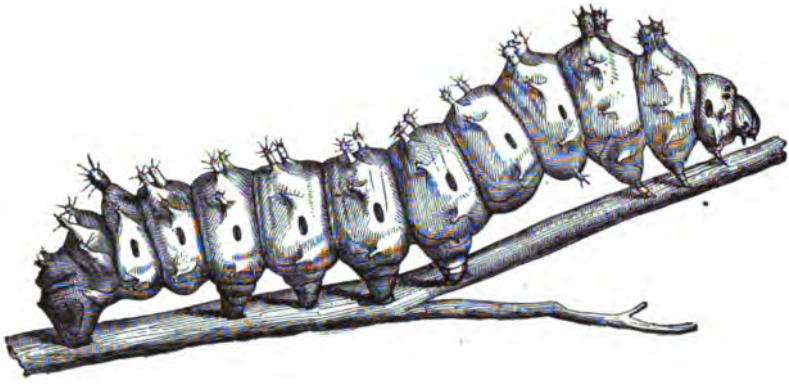

Cecropia Emperor Caterpillar.

Cecropia Emperor Moth (Samia Cecropia.)

Chrysalis of the Cecropia Emperor Moth.

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INSECTS INJURIOUS TO THE

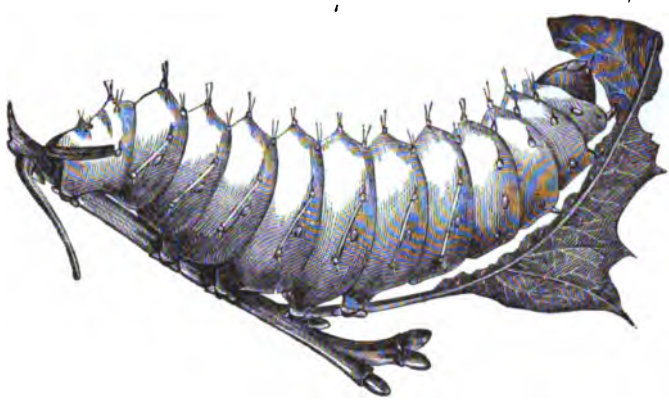
PEAR, CHERRY, PLUM & PEACH.

Pear Tree Slug (Selandria cerasi).

Plum Sphinx Caterpillar (Sphinx drupiferarum.)

Chrysalis of the Sphinx.

Plum Sphinx Moth (Sphinx drupiferarum.)



Polyphemus Caterpillar (Telea polyphemus), (plum insect).

Polyphemus Moth.

Cocoon of Polyphemus Moth.

Eye-spotted Bud Moth (Grapholitha oculana), larva and perfect insect.

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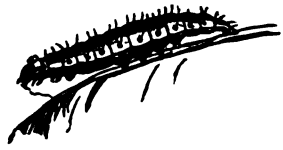
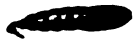
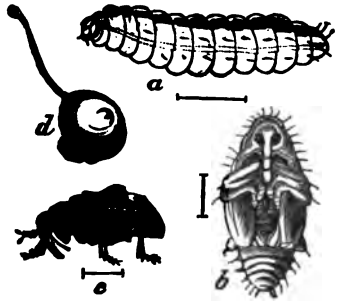


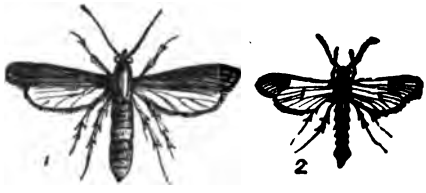


Larva of Oblique-banded Leaf-roller (Lozotæna rosaceana).

Moth of Oblique-Banded Leaf-Roller.



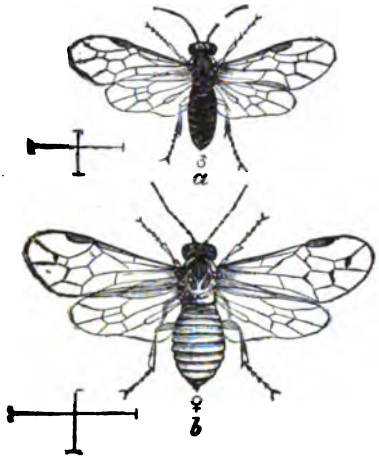
The Curculio (Conotrachelus nenuhpar)—*c*, beetle; *a*, larva; and *b*, chrysalis (all magnified); *d*, curculio (natural size) at work on a young plum.



Peach Borer (Egeria exitiosa)—1, female; 2, male.

INSECTS INJURIOUS TO THE

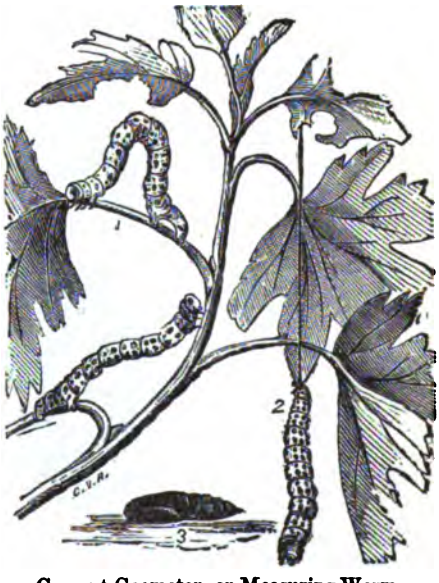
CURRANT, GOOSEBERRY, RASPBERRY AND STRAWBERRY.



The Saw-Fly (Nematus ventricosus)—
a, male; *b*, female.

Eggs of the Saw Fly.

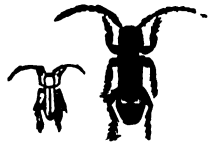
Larva of Saw-Fly, nearly full-grown—
feeding.



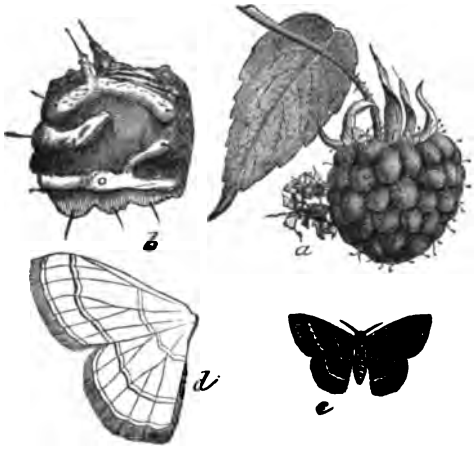
Currant Geometer, or Measuring Worm
(Ellopia ribearia.)

Gooseberry Fruit Worm (Pempelia grossularia)—Moth, and cocoon with chrysalis.

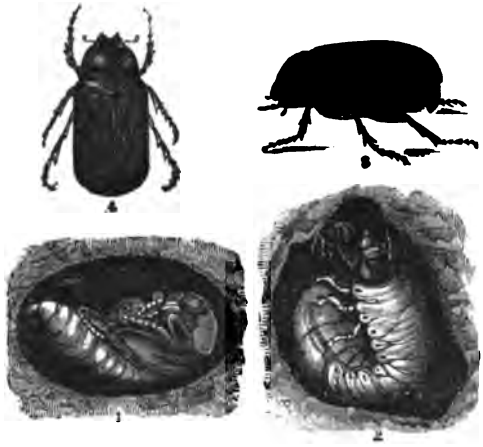
The Imported Currant Borer (Aegeria tipuliformis.)



The American Currant Borer (Psenoscerus supernotatus).



Green (Raspberry) Moth (Aplodes rubivora), natural size—*a*, larva on fruit; *e*, moth; and *d*, pair of wings magnified.



The White Grub (Lachnosterna Quercina)—the grub, chrysalis and perfect insect of the May beetle.

ONTARIO AGRICULTURAL COMMISSION.

APPENDIX D.

EVIDENCE

RELATING TO

GRAPE CULTURE AND WINE MAKING.

ONTARIO AGRICULTURAL COMMISSION.

APPENDIX D.

EVIDENCE

RELATING TO

GRAPE CULTURE AND WINE MAKING.

Sittings to take oral evidence at London, held July 20, 1880. *Present*—Messrs. W. SAUNDERS (Chairman), R. GIBSON and A. H. DYMOND.

MR. HASKINS'S EVIDENCE.

WILLIAM HASKINS, of Hamilton, was called and examined.

GRAPE GROWING IN ONTARIO.

To the Chairman.—I have been engaged in the culture of grapes for twenty-one or twenty-two years, and have had a good deal of experience with such varieties of grapes as are suitable to our district. The district embraces Hamilton as its centre, and the area between Hamilton, Niagara and some distance round on the north side of Lake Ontario. The area of Canada adapted to grape culture is very large, and I think would include all that part of Ontario south of the Great Western Railway, and some distance north of it. Taking from this city (London) westward, and south to Lake Erie, we would include some of the best grape growing lands in the Province. I understand that in Kingsville, Essex County, the Catawba may be ripened; and taking that as a test it is a better locality than Hamilton. A friend who resides in Ottawa, an enthusiastic grape grower, told me, that certain varieties of grapes ripened there, and I was surprised to learn that the Delaware was one of them. There are very few points in the vicinity of large bodies of water where grapes cannot be grown. From my own observation, and from what I have heard of Prince Edward County, I think it would be an excellent place to grow the earlier varieties of grapes. Grapes are a great deal cultivated in the district lying between Hamilton and the Niagara River, vineyards being attached to many houses, and planting is going on yet.

A VINEYARD OF THIRTEEN ACRES—THE YIELD.

I have a vineyard near Hamilton of about thirteen acres; or rather I have it in partnership with Mr. Bauer. The largest yield we ever got upon full bearing vines was four tons to the acre. There are varieties that will produce more. Vineyards of Concord grapes, well cultivated, will produce five tons to the acre. I have

never seen vines of that variety so overloaded that the crop was too large to ripen; but that will happen with other varieties like the Delaware. If you were to allow four bunches on the lateral they certainly would not ripen on the Delaware.

BEST VARIETIES.

The varieties that have succeeded best with us are all of Rogers' hybrids, except No. 1, which is too late to ripen. Rogers' No. 4 is a fine grape, delicious and prolific. No. 1 is a white grape, but it would be of no use to try to grow it with us. No. 3 is a very early grape. It does not set a full bunch always, though it is worth growing. No. 9 is a very nice grape, but it is a shy bearer, and so is No. 3. There is a peculiarity about the young wood of No. 9 with us. It is of a red tint, and the same tint is carried into the fruit. The next one that I know of is No. 15, which is a very rampant grower. It will do well on trellises, but if it is cut back it will not do so well. The Salem is said to be Rogers' best variety, No. 53 I think it is. When it can be grown in a sheltered position it is a delicious grape, but otherwise it does not do so well. I have not been able to grow it successfully in the field. No. 33 is a black grape, liable to mildew, but very good when it escapes the mildew. Rogers' hybrids were originated by crossing the wild Fox grape with imported varieties. I think Allan's hybrid was introduced before Rogers' and it was said to be the only cross at that time between the native and foreign grapes. Afterwards came Rogers' hybrids. A great many have been trying to hybridize since Rogers was so successful.

A GRAPE FOR THE MILLION.

Outside of Rogers' grapes the Concord is the grape for the million, because it will grow anywhere, where the summer is long enough, and almost any soil will produce a good crop. The Hartford Prolific I do not like, but many people prefer it because it is so early. It produces large bunches, but on the first cold night the berries will all drop off. With us it ripens about the last days of August or the first days of September. There is a similar grape to the Hartford, the Champion which came out lately, and I believe it is a seedling of that variety. It is earlier by five or six days than the Hartford. The Delaware is a grape that I would not be without. It resembles the European varieties, perhaps more closely than any other grape we have. We sell five or six tons of Delawares every year for table fruit, and it commands the market well. We sell them in Hamilton, and in this city (London). The Iona succeeds with us, but it is rather late. I can grow it in any quantity, but the season is too short to perfect it. On the Niagara River, or rather on Navy Island, it is ripened every year. The Diana is an old grape which many people overlook, but I think it is a very fine one. It ripens well with us if the vine is not allowed to grow too many clusters. It will keep until after Christmas. Some seasons it ripens irregularly, which is a serious draw-back. The Adirondack is a very fine grape, but too tender. The vines must be covered every winter with earth, and then we are not always sure of a crop. It is a delicious, juicy fruit. The Isabella I have fruited for several years, and, somehow, it degenerates. When we plant first we get a good crop, but in after years we find that we cannot ripen it. The leaves will strip off and the fruit hang without ripening. I do not think it is a desirable variety to grow. The Crevelling is one of our best grapes, but it does not set a good crop. Occasionally it sets a very fine bunch, but that is not always the case. In our vineyard we have two rows of Crevellings through the field, planted about twelve years ago, but I cannot say that we ever got a good crop from them. They are in a very exposed place, but I have a few vines in the garden in a sheltered position, and they produce fairly. I believe it is a South Carolina grape.

THE CLINTON AS A WINE GRAPE.

The Clinton grows very freely, and is very prolific; the most so of any wine grape we have, and that is all we use it for. Last year we had about 28 tons

[*Mr. Haskins.*]

of Clinton grapes and they ripened perfectly, better than for some years before. There is a peculiarity about wine made from Clinton grapes. It makes excellent wine, but it requires a few years to mature it; while other grapes make a wine that will be ready for use in a year. It holds so much acid in solution that it requires a longer time to precipitate it.

FOR MARKET OR TABLE USE.

I should think that the Delaware or the Concord is the most profitable grape for market or for table use. Then there are the Rogers' No. 4 and Salem, when grown in a sheltered position. Rogers' grapes always command a market for table use on account of their size, beauty, and sweetness.

SOIL FOR GRAPES.

For the growth of grapes I like a gravelly loam better than any other soil, and it should rest on clay sub-soil, or, better still, on the rock. When the soil rests on rock it should be eighteen inches deep at the very least, though it is a fact that grapes will almost grow out of the rock. I have seen in some of the American islands of Lake Erie, grapes growing and maturing very finely when the vines were resting on the rock with not more than a foot of soil.

MARKETS.

Our local markets are well stocked, but unless some grapes were turned into wine, should say that the market was overstocked. We send a portion of our surplus stock to Cobourg, Port Hope, and other towns and cities, and we ship as far west as London. The fruit usually sells at four to five cents per pound wholesale, and those grapes retail at eleven to twelve cents. At those figures I consider grape-growing profitable. Our crop does not suffer from late spring frosts, at least very seldom.

FROSTS—INSECTS.

I don't think the early frosts injure the Clinton for wine purposes, but they sometimes injure the more tender varieties if left hanging on the vines too long. The vines in our district are not injured by any disease or any insect. I have seen a little of the leaf-gall on the Clinton, but not on the others. I have seen nothing to lead me to believe that the Phylloxera exists at all here. The gall, I noticed, commenced on the east side of the vineyard and went through it and disappeared on the west. This year I observed very little of it.

AMATEUR VARIETIES.

For amateur growth I would give the same list as for market, and I would add the Rebecca, which is a white grape, and a good one for garden culture. I would also name the Diana, Crevelling and Rogers' Nos. 3 and 9. For an arbour I would select Rogers' No 15. Of these varieties Rogers' No. 3 and the Crevelling ripen the earliest.

PLANTING VINES.

The first requisite in planting vines, unless the land has a gravelly sub-soil, and is naturally drained, is thorough tile drainage. Good, deep plowing is the next thing, and it would be all the better with subsoil ploughing, although that is not absolutely necessary. I think that is all the preparation required if the ground is in proper condition. For planting I would select vines two years old as being better than those that are either older or younger. No matter how large the vine is when planted, it is set back for a year, and I don't think anything is gained by purchasing vines older than two years. If the ground is in proper condition, and kept cultivated and free

[*Ms. Haskins.*]

from weeds, and wire trellises are used, there is very little difficulty in growing grapes. Cuttings, with two eyes, put in sandy soil, and properly shaded and watered will always grow. I would shade them till September. I first take a frame like an old hot-bed frame, then a few light lath frames, covered with cotton, which can easily be lifted off when you want to water the plants. They require a thorough watering twice a-week. Very few propagate young vines for themselves, but I have rooted thousands of them. On Navy Island they are grown in a cultivated swamp, covered or mulched with swamp-grass, and they succeed well. Of course they don't require watering there, as the ground is moist all the time. I think growing them in a swamp is as good a way as any, but they must be raised in the fall, and transplanted in the upland. If left in the swamp in the winter the roots would perish. Vines treated in the way I have spoken of, planted the second year in rows on dry land, would be ready to plant in the vineyard, if well taken care of. Those in the frames need not be transplanted. In the vineyard I would plant the vines ten feet between the rows, and eight feet between the vines in the rows.

MODE OF TRAINING.

I prefer growing vines on trellises. We use cedar posts with four wires. The vines are generally planted running north and south, and I find that if the wires are fixed on the east side of the posts the prevailing winds from the west are sure to blow them down. It is better therefore to fix the wires on the side from which the prevailing winds come. To overcome the difficulty of the wires contracting in the winter, the ends of the wires are carried through the posts, notches are cut upon the outer surface of the posts at the points where the wires pass through, and pieces of oak lumber, one foot long and two inches square, are used as rollers, to which the wires are respectively attached. When they are not tight enough the oak rollers are turned and dropped into the notches on the posts, and thus the wires are held tight.

METHOD OF PRUNING.

When the wood is old we use the spur system of pruning, but where it is new we use the renewal system. We let two or three "canes" grow up from the vines every year and retain them and the old ones as well. On pruning, if there is a surplus of the young wood we cut out the old wood unless it is very vigorous and promising; but on the renewal system they should be renewed whenever there is young wood to renew with. I prefer healthy young wood to the old. It is seldom you have new wood enough for the renewal system, so we follow both systems. All the surplus wood should be cut out. I cut back to one eye, though some leave two. I would not calculate on having much fruit at the angle where the new wood joins the old. In advising a person with regard to growing grapes I would not insist on cutting back to one eye, but would say, cut off either to one or two eyes. If the grapes are in a garden the best time to prune is in November, and if in the vineyard I would prune in March, leaving them on the trellises through the winter. I would prune from the middle to the end of March. I have never had any difficulty from the bleeding of the vines pruned at that time of the year. The result of pruning in April would probably be that there would be more running of the sap than in March, and the flow would be so excessive that the vine might be injured. We never leave pruning so late that there is any such risk as that.

MANURE FOR VINES—ASPECT.

For grapes I think any well-rotted manure is good—stable manure which is rotted thoroughly. Manure from old hot-beds is also very useful, as are ashes, either leeched or unleeched. We once used on our vineyard four or five tons of bone dust, but it is too expensive, though we had a very good growth from it. We have not repeated the experiment since. For a vineyard, I prefer a south-eastern aspect, with the rows running north and south. If you start the vines at two years old they will take root the first year, grow one cane in the second year, and in the third year you will have a little fruit with a good deal of wood, and in the fourth year you should have a full crop.

[*Mr. Haskins.*]

EXPERIMENTS IN RAISING GRAPES.

I have experimented a good deal with new varieties, both seedlings from standard sorts, and also hybrids. I have had very good success, and have now some varieties which I consider very promising. I have been particularly successful in raising white grapes, and I have varieties which I consider superior to the Rebecca, principally because they are more prolific and hardy and more of a field grape than it is. I have one white grape similar to the Sweetwater and as hardy as the Delaware; and another one which is a white Delaware and very hardy. I have a third white one which has foliage almost as good as the Concord, and fruit transparent and of an excellent quality, and very large. I have also two black grapes which I consider very promising. These varieties have been selected out of hundreds, the rest having been discarded. I have one black grape, a seedling of the Crevelling, which is a better and sweeter fruit, matures earlier, and sets good bunches. It is a fine hardy variety, and is a good grape, either for table or wine. I think the production of new varieties of grapes is in its infancy, and that we will yet be able to introduce new varieties which will rival the French grapes, and enable us to produce more wine to the acre than they can in France—in fact we can almost do so now.

THE THRIP INSECT—FLEA BEETLE—THE ROBIN.

The Thrip insect has been found upon vines, but we have been singularly free from it, and the only reason I can give for our exemption is that we clean up the leaves of our vineyard so well in the fall there is no room to harbour them. I think we have had it once in ten or twelve years, and then it did not do much damage. I have noticed this year a little flea beetle that devours the bud. In the fall we plough the earth up to the vines, and cultivate thoroughly with a gang plough, so that any leaves that are left are turned under. We do not allow many weeds to grow in our vineyard, and it is now as clean as any garden. We have no caterpillars that devour the leaves to any serious extent. The robin is very destructive to the fruit. I think he destroys about a ton for us every fall, but we cannot keep him out of the vineyard. It is the only bird which I have observed doing much damage. There is a little bird which goes into the garden and punctures the grape, spoiling those, which he touches, but the amount of damage he does is very small.

FAVOURABLE LOCALITIES.

To Mr. Dymond.—Ontario is well situated for grape culture, the earlier varieties doing well in the north, and the later varieties in the warmer sections. Taking the whole Province I should say that the counties best adapted to grape culture are the old Niagara district, and all along the north shore of Lake Erie. Kent and Essex are particularly well adapted to the cultivation of the grape. The Catawba does not always ripen in the Niagara district. That portion of the north shore of Lake Erie which goes in by Lake St. Clair is, I think, the best adapted for grape culture of any portion of Canada. Its adaptibility I attribute to the climate. I don't think the Ottawa district is as favourable as Hamilton, because I know that some years they cannot ripen the Concord at Ottawa, while we ripen it thoroughly every year. I should think that Prince Edward County, near the lake, would be better than Ottawa, but not in the inland portion. Where I saw grapes growing in Ottawa was on a gravelley bank, near the river, and I think the soil had something to do with the fruit maturing; and though the season there is very short it is exceedingly hot. Perhaps the special soil, in the case I referred to, had more to do with the success of the grape than the locality. If grapes were planted in Ottawa, and the soil were similar to ours at Hamilton, they probably would not ripen every year. I prefer a rock subsoil, because the drainage is generally good, owing to the fissures in the rock. There may also be something favourable in the rock itself if it is of limestone.

[*Mr. Haskins.*]

TRADE IN GRAPES.

We have no export trade in grapes. In the event of a general failure of grapes in France I don't think we could have any sale for our grapes in Europe, because we could not pack them properly. A gentleman from Liverpool, after inquiring the price that we were getting in Hamilton, said, that if he had our grapes in the old country he could sell them for three times what we were getting for them. I don't think any system could be devised by which we could export our grapes in bulk. I have heard of Catawba grapes being sent to France, and that they were there very highly thought of. The grapes could not be gathered in a partially ripened state and sent to Europe with any profit. I am not a trained nurseryman myself, but an amateur, and gained my experience by my own practice. We don't grow vines in dwarf form. I don't think our native grape is adapted to that.

ASPECT—PRUNING—HANDBOOK.

An easterly aspect is good. A southerly aspect is better, but I consider an aspect between the two best of all. An easterly aspect gives you the morning sun, while a southern aspect gives you the meridian sun, but the time of day during which the sun goes around from the east to the south is the best part of the day. If you prune in the fall, I think the vine should be covered, else it is apt to kill back. In March you should cut off any part of the vine that may have been killed in the winter. The whole question of pruning is one of practical experience and judgment. There is a book published by Fuller, of New York, on the subject of grapes, which is considered a standard work. It is not bulky. There is another published by Husmann, of Missouri, which is a still better work, but it is better adapted to the south-west than to our country. We have no Canadian handbook on the subject, but our experience is probably about the same as in the State of New York. I have seen robins shot. They are so troublesome that people are obliged to shoot them notwithstanding the law. Our vineyard is not within the city limits.

WINE MAKING.

To the Chairman.—There is a good deal of wine made in our district. I have been engaged more or less in wine making for the last twenty years. I find that the public generally prefer native wines, after they have begun to use them. It depends a good deal on the variety of the grape how much wine a ton of grapes will produce. The Clinton gives two hundred gallons to the ton. Some people make two or three classes of wine from the crop, and in that case the first run from the press is taken and put away as being the best; then what remains is pressed, and it makes a second quality. The first run is generally colourless. After the grapes are gathered they are generally put through the mill so as to puncture the skins a little without crushing the seeds. If we are making one class of wine alone, after we have put the grapes through the mill, we put the whole mass, including the skins, into an open tank. We have tanks which hold about two tons each, made of oak staves. The mill is set over the tank and the grapes are put through until the tank is nearly, but not quite full—say, within seven or eight inches of the top. A lid is then put on the tank, and the mass is left there for a few days, care being taken not to allow the grapes to mould. In case we ferment the grapes with the skin we get a red or dark wine, that is, if we use a dark coloured grape. The Concord grape makes a very good light wine. The grapes are put immediately into the press, and the first run is put away as the best wine. After having pressed the remainder, and added sufficient sugar to give it proper strength and keep it, the second quality of wine is made. In making the second grade, water is put in to dissolve the pulp. The first run, if put away in barrels, will make good wine without the addition of anything, if the grapes have been well ripened. Before the second treatment we allow perhaps about a week to elapse, but the

tanks must be closely watched for fear of moulding. I understand that in France there is even a third pressing, which makes the *Vin Ordinaire*. You must have 10 per cent. of saccharine matter in order to have enough natural spirit. All the light wines contain 12 per cent. or more of spirit.

GLUCOSE—FORTIFIED WINES—SUGAR.

Thousands of tons of glucose sugar are used in the manufacture of wine in France and Germany. All the clarets we get in this country are prepared with grape sugar, while the ports and sherries, which we get here are fortified by the addition of spirit. Our clarets and sauternes are all fortified with grape sugar which is added, and then it is allowed to ferment. This practice arises partly from the fact that the grapes are not properly matured, and partly because the manufacturers desire to make more money. Both in Canada and the United States I am satisfied that sugar is added every season. There is no radical objection to the addition of a certain portion of sugar for the purposes of sweetening and maturing the wine. Sweet grapes should mature if properly ripened, but producers are apt to put in all together and then the mixture is fortified with the addition of sugar. There is no reason why we should not raise grapes here with a sufficient quantity of saccharine matter to make wine as good as the imported. I am satisfied that we will yet be able to raise wine that will rival the best imported article. I have now a small quantity of wine, made from my own seedling grapes, which I think is equal to any port wine. It does not follow that grapes which are showy and attractive for dessert purposes will make good wine.

WINE GRAPES.

The grapes, available to the public, which make the best wine are the Concord, the Clinton, and the Crevelling, and you can get a nice white wine from the Diana.

MANAGEMENT OF WINE.

To Mr. Gibson.—The reason that I omit the Catawba, is that we cannot ripen it. When the wine is in the barrels, you must leave the bung loose while fermentation is going on. The sediment should be taken out about Christmas. We generally rack it off with a syphon, the tube being put down within four inches of the bottom. The Clinton wine requires longer to mature than the others, and should have at least three or four years. The difficulty with some who make wine in this country is that they think it should be fit to use in three months. It should be kept until it is quite bright and the fermentation has altogether ceased. If you look into a vessel which had contained Clinton wine, you would find crude tartar deposited in the form of crystals, in large quantities. The subsequent treatment is only a question of racking off, and keeping the vessel bunged, etc. If you draw off half a vessel, and leave the other half, you will find that the wine will be injured if a very light wine. I think the Concord grape wines and the Diana will mature earlier than the Clinton.

OUR NATIVE WINES.

To Mr. Dymond.—In point of strength I think our native wines are a little stronger than the imported ones, and as to price we can produce and sell them cheaper than we can buy any claret that is fit for use. We get from $1.25 to $2.50 per gallon for wine. We have some which we rank with clarets and wines of that class, and there is another class that we rank with the sherries and ports, though, as a rule, our wines are lighter than ports and stronger than clarets. Their wholesomeness depends a good deal on the honesty of the manufacturer. I don't know of vinegar being made of these wines. A man might sell all the table grapes he could find a market for, and crush the remainder and make them into vinegar.

[*Mr. Haskins.*]

PROSPERITY OF THE WINE TRADE.

To the Chairman.—In view of the fact that a large number of vines in France and other European countries are being destroyed by the Phylloxera, I think our prospects are good. I never had any view of shipping the wine to England. I remember showing one wine to a gentleman from Birmingham, and when he tasted it, he said he would take all we had of that kind, but I happened only to have a little. It is a sort of wine which we are endeavouring to produce from our own seedling grapes, and I am satisfied that if we can produce it in quantity we will find a ready market in England for all that we can make, I see nothing to prevent Ontario from becoming a wine-producing and wine-exporting country. I think the supplying of our people with a wholesome light wine would be an advantage, as I don't think such wines produce an appetite for stronger stimulants. I think the industry will yet be a profitable one. It admits of considerable extension within the district I have mentioned.

To Mr. Dymond.—I think the duty on wine in England is half a crown (60 cents) per gallon. I am satisfied that I could sell wine of the kind I mentioned to almost any extent in England. It is what might be called a light port. I do not know whether we should sell it as port or give it a new name. If we were introducing our wines into England I think it would be better to name them after some portion of our own country—Niagara, for instance. I would not call it port, else I should not be able to sell it in England.

To Mr. Gibson.—Glucose is mostly made from corn in this country, but it is also made from potatoes. I remember importing a large quantity of French glucose to fortify wine, but I spoiled the whole vintage, as it gave the wine a bitter taste. I have since learned from Mr Saunders and others that they make a better article of glucose in this country from corn. It is very suitable for the purpose of making wine.

PEACH GROWING ON NAVY ISLAND.

To the Chairman.—I am interested in the growth of peaches on Navy Island. We planted 9,000 trees there, and they are bearing this year and have a very large crop. I think we will have over 7,000 or 8,000 bushels. Any kind that will grow there will grow in the Grimsby district. Three-fourths of those we planted were Early Crawford, and the other fourth were early varieties such as the Early Beatrice and others. I think the Crawford is the most profitable for market. We had a good crop last year. We sold them in Toronto and Hamilton, and found a ready sale for them all. The trees did not suffer last year from yellows, but I think that disease is coming in this year. We were told that some trees had it, but our foreman afterwards informed us that they were girdled with mice. We have had no experience in trying remedies for the yellows. The fruit does not suffer much from the curculio. We have a crop of apricots this year, and they are not at all affected by the curculio We grow the Early Golden and the Morepark apricots.

To Mr. Dymond.—I think the apricot will grow and thrive within the Niagara district. On Navy Island we grow it just like the maple or any other tree.

To the Chairman.—Our peach trees are not injured by the borer, and I do not know of any other insects troublesome to them Mice at one time were very troublesome, but there came a great rain storm two years ago, and drowned them out, and there are now no mice on the island. For peach culture I would recommend a loam soil, rather light, though they grow very well on sandy soil, and in the United States I have seen them grow very well on clay. The land should be well drained.

WORK IN THE VINEYARD.

To Mr. Dymond.—I put about four men on in the spring to prune about thirteen acres, and they get through in two or three weeks. Then comes the tying up of the vines, which is done by women. We cultivate with a gang plough, and the soil which was ploughed up to the vines in the fall is hoed out when the first weeds begin to come.

[*Mr. Haskins.*]

When the vines grow out we find there are many straggling shoots, and the women go through them and tie those up which we want to save, and any long vines growing over are cut off. We just keep back the tops. We never thin them out. In picking time we employ about twenty-five hands—two men and a number of women with baskets—that is, when we are picking for wine. Picking market fruit is done by two or three careful hands, who go through and select the best. For wine, the vines are picked clean, and the fruit moved to the cellar every night, and put through the mill the same night.

WILLIAM HASKINS, C.E.

Sitting to take oral evidence, held at Chatham, July 22nd, 1880. *Present*—Messrs. W. Saunders (Chairman), and A. H. Dymond.

MR. TOLL'S EVIDENCE.

James C. Toll, of Raleigh, Kent, was called and examined.

GRAPE CULTURE IN KENT.

To the Chairman.—I have only a small patch of grapes, but I think I cultivate them well. I have one acre planted in grapes. I cultivate the Concord chiefly, though I have also the Delaware and Clinton. Grapes are not so much cultivated as they were several years ago, owing to the fact that people were too careless in attending to them, and results were not satisfactory. The prices realized for the fruit had also perhaps something to do with the falling off.

THE MARKET—PRODUCTION.

With care in cultivation I think the crop is a very paying one. I sell Concord grapes chiefly for table use. Chatham is our principal market, but we attend the fairs with the fruit. There are other growers who have much larger patches than I, and they all find a sufficient market for their grapes. The consumption of table grapes has largely increased of late years. There is no extensive manufacture of wine in my district. We sold our wine grapes at Toronto for a time, but not of late. I don't know of any demand for Clinton grapes, and I dug up my vines of that variety. I believe wine-making would pay here as well as anywhere. About three tons per acre is the average production of the Concord grape, and we get from 3 to 6 cents per pound for them. There is a demand for all that are grown in the neighbourhood now, but I don't think the industry could be very much extended and have sufficient demand for the crop. The grapes could be shipped up north I suppose. I think a good business could be done in that way, but I have not had much experience.

FROSTS—THE CATAWBA.

Along the lake the crop does not suffer from early spring or late fall frosts. Our earliest severe frosts occur about the middle of October. I have tried the Catawba grape, but it does not ripen well. The Isabella ripens, but not so well as the Concord. I have had no experience with Rogers' Hybrids, and have never grown the Champion or Hartford Prolific. I think all the grapes that will ripen in the Niagara district will ripen well here. I think the strip of land along the lake shore is specially adapted to grape growing.

CARELESS CULTURE.

The carelessness in culture to which I referred consisted in this: that many people set out their vines and never took any care of them at all. Some were not trellised or

cultivated in any way. The vines were not pruned, and grew up so thick that they did not yield half a crop. A crop may be got in that way for a year or two but not longer.

HOW TO PLANT VINES.

My vines are planted ten feet apart each way; that is the distance which is generally adopted, and I think it answers very well. I use white wire trellises with posts every ten feet. I use only two wires. I place the top one about four feet up on the pole, and the lower one two feet below it. I don't allow any fruit to grow under the lower wire. I have one trellis with three wires, but I don't think it is any better than the others.

MILDEW—INSECTS—BIRDS.

I think keeping them open prevents mildew. We do not suffer very much from mildew, but when the vines grow thick and fall on the ground they are apt to mildew. We have a form of it which turns the berries white; the other form, the rot, sometimes appears on the Clinton but not on the Concord. Practically we have found no difficulty in growing the Concord well with ordinary care. The Clinton grape has been troubled by a kind of insect that made knots on the leaves or a sort of leaf-gall. Wherever the Clinton has been grown during the last few years it has been affected in that way. I have found no species of bird destructive to the fruit. I don't think we have robins here at the time of the year when the grape ripens.

THE SOIL.

The soil in the district I speak of is gravelly, with dry bottom.

JAMES C. TOLL.

Mr. Toll was examined as to the other fruits cultivated by him, his evidence on which subject will be found elsewhere.

CHATHAM, *July 23, 1880.*

Present—Mr. F. MALCOLM (Chairman), Hon. S. C. WOOD, and Mr. DYMOND.

EVIDENCE OF MR. GIRARDOT.

THEODORE GIRARDOT, of Sandwich, School Inspector for North Essex, was called and examined.

GRAPE CULTURE AT SANDWICH.

To Mr. Dymond.—I devote considerable attention to the growing of grapes. I have about one acre and a half under grape culture, of which about one acre is bearing. Some time ago there were a few grapes cultivated in North Essex, but they were not growing to any extent. At the present time in the North Riding there are between eighty and one hundred acres of grapes.

WINE GRAPES.

I am growing grapes chiefly for wine, and have turned my attention to wine-producing grapes. I have tried different kinds, but the most successful is the Concord. The Clinton and the Delaware are also good grapes, but the Concord pays best.

[*Mr Girardot.*]

WHAT AN ACRE WILL PRODUCE.

I can grow between four and five tons to the acre. Two years ago the crop was about 150 bushels to the acre; last year it was 130. From four tons of Concord grapes we can produce between 500 and 600 gallons of wine. I am manufacturing wine both for my own use and for commercial purposes. The value of this wine is about $1 per gallon. The Concord grape bears evenly year by year, and for five years we have had no failure of the crop. I consider that grape culture in our part of Essex is a perfect success. I live in Sandwich.

ESSEX SUPERIOR TO FRANCE.

I was born in France, but I don't think there is any part of France where grapes bear so much or do so well as in Essex. I was acquainted with the culture of the vine in France before coming here. In that part of France where I came from vines were cultivated upon small poles, 3 or 4 feet high; here we cultivate on trellises.

METHOD OF TRAINING.

I use wires on posts about 6 feet high and four wires to the post. In the Southern part of France they grow a sort of dwarf grape-vine, not the same description of grape as ours at all. Each part of France has its own kind of grapes.

COMPARISON WITH FRENCH WINES.

I prefer the wine made from the Concord grape to that which is made in France. I think the clarets and other light wines which we import from France are inferior to our Concord wines. The latter would be a medium wine between No. 1 and No. 2. In 1878 I took out with me to France samples of native wine manufactured in Sandwich, and connoisseurs there declared it superior to the Vin Ordinaire, which is sold in that country under the name of Bordeaux. Without the duty we could import Vin Ordinaire at a cost of from 50 to 60 cents a gallon, but that wine would not be equal to ours. I think to import an article equal to ours would cost as much as ours does at present. Ordinarily it would cost from 50 to 60 cents per gallon in France. We can supply a good, sound wine here, equal to the French, at a much less price than we could import the French wines and pay the duty. I do not think that the wines imported from France are, as a rule, anything like so wholesome as ours, because the foreign wine is generally doctored a good deal.

A LITTLE SUGAR NEEDED.

We have to use some sugar in our wine, but in France they do not require it. Our grapes are a little more acid than theirs, and I think adding sugar gives the wine body. We could make a pretty good wine without putting any in, and I would prefer it myself; but the people here want a wine that is sweet and strong. We put one pound of white sugar to every gallon of grape juice.

STRENGTH OF CANADIAN WINE.

In some of our wines there is about 10 or 12 per cent. of alcohol. Bordeaux contains 8 or 9 per cent. of alcohol. For ordinary purposes the longer the wine is kept the better. It is not drinkable before it is six months old, and it is better still if it is kept for a year.

A READY SALE.

A cousin of mine, who is also a neighbour, has about two acres of grapes, and sells his wine just as fast as he can make it; he understands the manufacturing of it thoroughly. He is selling his wine new, and I have been doing the same just because our friends will not let us keep it long enough.

[*Mr. Girardot.*]

PROFIT OF GRAPE GROWING.

I think a man who would cultivate two acres of vines and give his time to them and make the wine in the proper way would be able to support his family better, and make more money than a man with a hundred acres could in any other way.

PLANTING AND PRUNING—TYING UP.

We plant two-year old plants and sometimes they will produce a few grapes the first year; the second year they will give a small crop; the third year they will give a pretty good crop, and the fourth year a full crop. We generally prune in the winter. I think February or March is the best time, but even January will do. They should be pruned long before the sap begins to rise. We do it just when there is nothing else to do, and it is the first operation of the year. We tie the limbs just after pruning. In pruning the limbs, to get sufficient vigour five or six buds should be left, and if the vines are poorer, three or four should be left. We prune from the bottom of the lowest wire and don't allow any to get higher than the third. We leave the fourth to tie up the growth of the year. When the vines are five or six years old we renew them, and we always leave enough young branches in the root to renew the vine. In France the tying up is done by women, but we have men do it, though it is an occupation to which women are well adapted. Pruning requires judgment, but tying does not require much. When the fruit has formed we cut two buds above the last bunch of grapes so as to keep the sap in the vine. We have to renew two or three times in the course of the summer. The plant does not bleed at all after its foliage has formed.

TIME OF RIPENING.

The time when the Concord ripens depends a good deal on the season. Two years ago we had some ripe on the 7th of September, but last year it was on the 17th or 18th of that month. The later the Concord is pulled the better, but we have to pull ours a little earlier than we should, for fear of boys and birds. If they were left later they would require less sugar when manufactured into wine.

PROCESS OF WINE MAKING.

In making wine I generally use a cider mill, though I could use anything else that would answer the purpose. We throw the grapes into the mill and grind them, and we then throw the juice—skins and all—into a tub holding one thousand gallons. If we want to get a white wine we draw it off before it begins to ferment. The remainder we leave to ferment from eight to ten days, and that makes the red wine. We can generally guess how much sugar to put in. By fermenting with the wine the cane sugar is turned into grape sugar. We use only the purest white sugar, as the brown imparts an offensive taste to the wine. The grapes themselves will give enough "bouquet" to the wine without adding anything else. We should be careful to use only clean barrels. We leave it in the vat eight or ten days, stirring it every day except the last two so as to give the juice a chance to go to the bottom. It is then put into casks, the bung just being put in lightly so that fermentation may go on. Some put a bag of sand on the bung-hole. The wine is left in the casks until we think the fermentation is over, and then we tighten the bung a little. The balance of the juice we press a little, but we do not mix the second lot with the first as it makes a poor quality of wine.

ADULTERATION OF FRENCH WINE.

When the French Vin Ordinaire leaves the vineyards it is the pure juice of the grape, but when it goes through two or three hands you cannot tell much about it.

[*Mr. Girardot.*]

CLEARING THE WINE.

About the month of March we clear our wine by racking and putting it in another clean barrel so as to get a perfectly pure, clear wine. About the time the vines begin to grow in the spring when the warm weather comes in, the new fermentation begins; but it does not hurt the wine. After that fermentation is through it has to be racked again and transferred to another barrel. It may then be bottled if desired. From the time it is first made in the vat it is racked three times altogether, and is then fit for use.

THE CONCORD GRAPE PREFERRED.

The Clinton grape makes very good wine, but it does not bear so well as the Concord. Not only does the Concord bear better but the berries are larger and have more juice. The Clinton does not ripen evenly on my place, and there are always green berries upon the vines even when they are kept late. These berries spoil the wine. There are never any green berries on the Concord vines. The Clinton is susceptible to a disease under the leaves—a sort of leaf-gall which prevents the grapes from ripening well.

VARIETIES OF GRAPES.

I tried some other varieties of grapes but I pulled them all up this spring, and I have now only a few plants of Delawares just for the table, a few Clintons, three or four Rogers', and all the rest are Concords. I have also a few plants of Catawbas, but it is difficult to get them to ripen regularly. They are also more liable to frost. The grape-growing district of our county extends back from the river four or five miles, but the principal place for grape-growing is right along the river on account of there being so little frost. I prefer a south-eastern or south-western aspect for a vineyard.

CURE FOR MILDEW.

In case the vines suffer from mildew sulphur puffed around the foot of the vines with bellows made for the purpose, cures them. This operation must be repeated as often as there are appearances of mildew.

PRICE OF GRAPE LANDS—THE SOIL.

To the Chairman.—You can buy land suitable for cultivating grapes within the corporation of Sandwich for $100 per acre, but outside the corporation it can be got much cheaper. You can purchase just as good land at Petite Cote for $50 per acre. Some of our vines are planted on gravel land and some upon clay, but I prefer the gravel, as I think a light, gravelly soil is the best. Where my vineyard is the gravel is six feet deep. We manure every second year, using only stable manure well rotted.

COST OF A VINEYARD.

Upon a two-acre vineyard the capital required for wine making would be as follows: For the land, $100; for 1,500 plants, $30; for posts and wire, $150. Then there would be the fencing; but you could plant the land with potatoes or some other crop until the vines began to yield a return. The tubs, crushing machine, and everything else required would not be more than $100, including the tools required in cultivating. From the month of May till the grapes are ripe the cultivation of a five-acre vineyard would require the whole time of a man with a pretty large family. The sugar costs about 10 cents for every gallon of wine. If the whole county of Essex were to go into the manufacture of wine our wines would sell just as well as now. We sell our wine to gentlemen in the neighbourhood for family purposes, and to doctors and druggists who prefer it on account of its purity.

TH. GIRARDOT.

[*Mr. Girardot.*]

Sitting to take oral evidence, held at Toronto. *Present*—Mr. Brown (Chairman), Hon. S. C. Wood, Mr. Aylsworth, and Mr. Dymond.

MR. JOHN HOSKIN'S EVIDENCE.

John Hoskin, Q.C., of the Dale, Toronto, was called and examined.

GRAPE CULTURE IN TORONTO

To Mr. Dymond.—I reside in the neighbourhood of Toronto, and I have about a thousand grape vines, covering 1¼ acres of ground. The land is situated high, to the north of the city. The soil is a sandy loam, not very sandy however where the vineyard is. I have been in the cultivation of grapes about six years, it being that time since I planted out the vines. I cultivate the grapes for the purpose of making wine. I came to the conclusion long ago that this country could produce an excellent quality of wine if they planted the right kind of grapes, and if they would be honest in the manufacture of the wine.

THE DELAWARE THE BEST GRAPE—THE "FOX."

After reading all I could on the subject, and making personal inspections of some of the vineyards of Canada, I came to the conclusion that the best grape for wine making was the Delaware. This grape in the first place is very free from what is called the "fox." All that are interested in the cultivation of grapes know what that means. What we mean by the "foxy" grape is a mousey flavour, such as may be tasted in the Concord and Clinton; for instance, the taste is similar to the smell of a cup in which a mouse has been. The Delaware is also very free from disease. I know the Clinton and Concord are grown extensively for wine making in Canada, and that has given the wine of Canada a very bad name. The Delaware will only make a light coloured wine.

RED WINE GRAPES.

For a red wine, and a class of wine which I know to be very rich, I have grown two kinds of grapes, the Alvey and the Creveling. Mixing those with the Delaware a splendid red wine is made. All the wines are sparkling. This wine is free from the foxy attribute. The Alvey is a grape which few have in Canada. My father-in-law and a gentleman near St. Catharines, and one or two others, I believe, are the only ones who cultivate this grape. It came from the States, and is well known there. After reading descriptions of the various grapes I selected that variety as the best that could be used for this country. I was doubtful at first whether it would ripen in time, but I find it ripens a little too early if anything. The birds carry them off. It is not so prolific as the Delaware. Richness and flavour are the qualities of the wine made from it. These two or three ideas I have mentioned are merely for the benefit of people in Canada who feel disposed to make wine.

NO SPIRITS TO BE USED—THE "MOUSEY" FLAVOUR.

It is a mistake to put up any spirits in the wine. It is difficult to describe the mousey flavour; I can't describe it any better than I have. The taste is analagous to the smell of a mouse. I had some of the Concord and Clinton vines planted but I plucked them up. These three varieties are the sorts of grapes from which I make my wine, but with the red wine I add a few of Rogers, Salem No. 8, Merimac 19, and the Agawam. These add to the taste of the wine.

THE CONCORD CONDEMNED.

I don't use the Concord at all. I condemn it for wine making. Of course you can make wine from it, but you will never touch Concord wine as long as you have

Delaware in the house. For quantity the Concord is to be preferred, but it does not with me ripen so early as the Delaware; that is another thing to be borne in mind in the cultivation of grapes. Your grapes ought to be gathered by the 1st of October, for after that you are never safe from frost. The Concord is if anything a little better for a little frost. The frost does it no harm. Slight frost will not hurt the Delawares that are ripe at the time, but if they are not ripe and are attacked by the frost they fall off.

MANAGEMENT OF THE VINEYARD.

I manage my vineyard something as follows: the best way is to take vines two years old, and for the first year grow one cane, keeping back the laterals. For the second year grow two canes, keeping back the laterals of those two. The next year you will have some splendid fruit from those two canes, and your vineyard will be uniform. Every year thereafter you should grow a cane or two canes, cutting off the old ones. I train them on wires. They are trellised and arched over. Mine are trained about six feet two inches, so that an ordinary gardener can go through and prune them without standing on a stool. You don't want to be obliged to stand on anything when you are cultivating a great many vines. I find that three or even two wires are quite enough. I prune the vines in the spring. Hitherto I have taken the vines down in winter and covered them with earth. Last year I came to the conclusion that that was not necessary, and I allowed various varieties to remain uncovered to see if it made any difference, and there was no difference at all. This year I shall leave them uncovered altogether, and they can then be pruned in March. If I were to prune them in the fall it would be in view of laying them down, and to save time in the spring. Some of my vines are six feet apart and some twelve feet.

YIELD OF WINE PER ACRE—PRUNING.

I can't say as to the quantity of grapes that can be grown from an acre of ground; I can only speak as to the quantity of wine. The year before I had over 600 gallons of wine, pure juice of the grape, from about 1¼ acres. I never weighed the quantity of grapes I got. I don't adopt the spur system in pruning. It is a little difficult to describe the method I adopt. I have regard of course to the new wood, and take off all the old wood I reasonably can. If you grow them on the spur system you must have your vines farther apart. If you grow them over the trellis, on the arbour system, you can grow them nearer, because you use the supports overhead. If grown on the arbour system the heat at night during September, when they most want it, is confined, and assists in ripening the grape.

MANURE—MILDEW—SULPHUR.

I have but little trouble from mildew. Stable manure is conducive to mildew. I don't intend to use any stable manure hereafter, but shall employ bones and phosphates instead. Sulphur is good for mildew.

THE IONA GRAPE.

I have grown the Iona, which I think make the finest wine produced on this continent. I have about eighty of the Iona vines. I grow it on my place because it is particularly favoured for its growth, being sheltered from the north. Except in favoured localities I would not recommend the cultivation of the Iona grape. It is a grape somewhat of the Delaware class, but about twice the size; it makes a very brisk and aromatic wine, and is altogether free from the fox. It is a hardy grape and healthy, but in ordinary places it does not ripen; it ripens with me, and I have made wine every year from it. It would ripen in the Niagara district I think. I would not advise its being cultivated north or east of this; it is as prolific as the Delaware. After having given it a trial I put in some forty or fifty more last spring. There is no wine like it on this continent. It was for this wine an extra prize was given me at the Exhibition. I exhibited six varieties of wine there, and they gave me the first six prizes, and I exhibited five in

Toronto, and they gave me the first five prizes. The goodness of this wine was owing principally to the Iona and Delaware.

PROCESS OF WINE MAKING.

My process of making wine is very simple. I have no machinery, and use no press at all. The grapes are put into vats and covered, and the man just presses them, squeezes them with his hands, and rubs them round with a stick, but so as not to bruise the stones. He uses the slightest possible action so as to get what is really good juice, and from this process the juice will flow away if the grapes are ripe. The grapes are allowed to remain five or six days in the vats fermenting; I don't do anything with them during that time. When the must begins to fall a little I draw it off into casks; I throw out the residue into the manure heap. The fermentation goes on probably for a month in the cask which is bunged up. I don't use anything for refining the wine; it comes out as clear as crysal; it is wine after it is run out into the casks. I only make one description of wine, and do not make any from a second pressing. I never put spirits into the wine because in the first place it destroys what you may term the brisk quality, and secondly if you have spirits or alcohol in wine the first thing you taste is the alcohol and not the wine. Any person who is an adept at it will tell you at once if there is any alcohol in the wine or not.

ANALYSIS—STRENGTH.

I find that the spirit generated by fermentation is sufficient to keep the wine. I have had the wine analyzed, and have found it to contain thirteen per cent. of spirit. My wine compared with the ordinary light wines is stronger. I don't make a business of selling the wine of course, but I have realized $7 a dozen bottles, champagne quarts. I don't know how many gallons would be in the dozen bottles. That price would be a profit, and I could sell it all in England at the same prices.

CANADIAN WINE STANDING A VOYAGE.

It has been alleged that Canadian wine does not keep in being taken over the Atlantic. That this is not so I established satisfactorily this summer, when I took some of the wine to England. When I had got there it was in a perfect state of preservation, and I observed no change whatever in it.

CULTURE OF THE VINE BENEFICIAL.

I think that the culture of the vine and the manufacture of wine can be almost indefinitely increased in Canada. The increase of the manufacture of good wine would act as a counteraction against the use of whiskey. If a person acquires a taste for light wines he will never acquire a taste for whiskey.

USE OF SUGAR.

My wine is a sweet wine. I forgot to mention that during the time fermentation is going on I put a little sugar in, three-fourths of a pound of white sugar to a gallon of wine. That is all the addition I make to the wine, and that assists fermentation.

CHEAP WINE.

You have observed that in some kinds of claret there is a very rough taste. Such wine is from the second and third drawings, and that rough taste comes from squeezing the skins and breaking the stones. If our grapes are pressed in the same way we get these qualities in a greater degree. I don't consider that those wines are injurious to health, on the contrary I think they are very beneficial. I don't think the second or third drawings would be deleterious. For the poorer people a very cheap wine could be made in that way, but of course it should be borne in mind that wine can't be made from sugar and water only.

JOHN HOSKIN.

[*Mr. Hoskin.*]

In order to make the evidence on Grape Culture as complete as possible, and to present it in a convenient form, it has been thought desirable to append to the oral testimony of witnesses specially called to give information on that subject, extracts from the evidence on Fruit Growing of some other well-known representatives of the fruit interests, and of various sections of the country.

MR. BEADLE'S EVIDENCE.

Extract from evidence on Fruit Growing and Forestry by Mr. D. W. Beadle, of St. Catharines.

Grape Culture—Varieties.

Grapes are very generally cultivated in our district, but not to a large extent by any one person. Any variety that will ripen in our climate will succeed well. Perhaps the Concord is the variety which will give the largest return with very little attention and labour, but of course the price is not high—I suppose about five cents a pound.

The Champion or Talman.

There is a variety of grape known by us as the Champion; it is known also by the name of the Talman. At least I believe them to be the same grape, though that is disputed. It is a very early ripening grape; it ripens with us in August, and on that account it sells readily and is a profitable grape. When I spoke of five cents a pound I meant that that was the retail price in our market. The grower does not get more than three or four cents.

Profitable Grapes.

To the Chairman.—I presume that during the grape season you could go into our stores and get the Concord for five cents, but if you got a dozen pounds, you might get them for four cents per pound. Next to the Champion comes the Hartford Prolific, which is very profitable, because it is early. Next to it in time of ripening comes the Concord, which seems to carry the day, it is so easily supplied in large quantities. It generally brings down the price of grapes, even of those which are larger, finer, and more highly flavoured. The Champion and the Beaconsfield are the same kind. Those three varieties are at present, I believe, the most profitable grapes. The White Grape, which proves to be hardy and productive, when it comes into the market will be the next most profitable. The Martha has not filled the bill so far. It does very fairly, but for some reason which I cannot tell, it does not rank very high.

Market—Grape Culture Profitable—Frosts.

Grapes like a warm, porous soil abounding in lime. A good many of our surplus grapes are shipped to Toronto, and, I think, to Montreal. The Champion will sell for about fifteen cents per pound, just because it is so early. Grape culture I consider a profitable industry. Concord grapes at four cents a pound will yield more money per acre than most other varieties. The grape sometimes suffers from late spring or early autumn frosts. Two years ago we had a frost in May, and we thought it had ruined the entire crop, but the vines threw out a second growth, the fruit ripened, and we had a fine crop. There are a lot of dormant buds in the grape, and if one set gets killed, the second set will push out and the fruit will mature if the season be long enough. We have not been troubled with any injury to the fruits or leaves of the vine.

Mildew—Insect Enemies.

Perhaps, however, I should qualify that answer. There are some varieties—none of

those I have mentioned—which are subject to mildew, a disease affecting the leaf. Many attempts have been made to plant the European grapes in Canada. The vines will grow for a while, sometimes they will bear a crop or two, but in the end they will all succumb to the mildew. During the winter I received an inquiry emanating from the Commissioner of Agriculture about some parties abroad bringing in and planting European grapes, and I replied it was utterly useless; that the experiment had been tried and had proved a failure and that it always would prove a failure. There are a few varieties of our own—the results of hybridization—that are more or less subject to this disease. Occasionally we see some mildew upon the Delaware, but not often. There are no insect enemies that prove serious. The little steel-blue beetle *Haltica Chalybea*, eats out the bud just when it is bursting. It eats the grape, of course, but I find that, by watchfulness, it can be kept in subjection. The larvæ are well known, having been described in our horticultural works and reports. Occasionally there are a few *Sphingidæ* and similar caterpillars that feed on the vines, but they are not numerous.

Birds.

We are troubled a good deal with birds. I am not just certain what kind of a bird it is, but there is some little sharp-billed bird—I used to think it was the wren, but they are not numerous enough to produce the mischief—which sticks its bill into the grape and then passes on to the next and treats it in the same way. The robin generally swallows the berry and is done with it. One of my neighbours has a pretty large vineyard of Concords, and I remember one year the robins came by hundreds and nearly ruined his whole crop. He has not been so troubled with them since, and last year the crop was as abundant as ever. We have several other varieties of the thrush, but I don't think they do much damage. In the case I spoke of in which the robins did so much damage, there were woods near by. Almost all of our sparrows frequent shade trees and orchards, where they come early and find hiding places. The little bird which I mentioned as being so destructive to the grape is, I think, either a wren or one of the chirping birds of the sparrow family.

The Phylloxera.

To Mr. Dymond.—Unfortunately in Europe they have imported an American insect that is laying waste the vineyards there with terrible destruction, the grape louse or phylloxera. It is believed by naturalists that it has two forms, one feeding on the leaves and the other on the roots; I have seen the leaf form on my own grounds but not for several years. In some parts of the United States this insect has been prevalent, and vineyards have suffered from them. In some parts of California it has been a serious detriment. There are some varieties of our native grapes which are thought to be proof against it. When I say that it has two forms I mean that it attacks the leaves and the roots at different stages of its growth.

To the Chairman.—I think it is thought by Professor Reilly that the form that feeds on the leaf is never complete—that the egg-laying form of the creature is never produced from the leaf louse but comes from the root louse.

To Mr. Dymond.—I don't think the injury to the vine is serious so far as they affect the leaf, it is only when they attack the root that the vineyard is destroyed. We do not suffer to any appreciable extent in Canada from the insect which I spoke of as having been imported into Europe from America, but I believe they do in some parts of California.

Wine Grapes.

To the Hon. Mr. Wood.—I have not given any consideration to the cultivation of a grape for the manufacture of wine, though there is something in that way done in our district. The grapes I have mentioned are table grapes, not wine grapes. The grape most profitable for wine so far is chiefly the Clinton, with some admixture of others. I cannot say that the wine grapes are hardier than others. The Clinton belongs to another class

[*Mr. Beadle.*]

of grapes; both are American, but botanists place them in two distinct classes. The Clinton grapes are juicy, acid, but not very palatable for table purposes, these qualities tending, perhaps, to make them valuable for wine purposes. The table grapes I have referred to are all out-door grapes. They are not laid down and covered in winter in our district; it is a very great advantage not to have to cover them up.

The Grape Indigenous.

To Mr. Dymond.—Our grapes are all indigenous to this continent—they are native grapes. They have been raised by horticulturists by sowing the seed of native grapes. Those I have mentioned, the Champion, the Concord, and the Hartford Prolific have all been raised from seeds grown in this country, from native grapes. There are others, such as the Massasoit, which are a cross between the Fox grape and the foreign grape. The other grapes I have mentioned are descendants of what is known as the Fox grape. The Clinton is quite distinct in its habits and character. I have been told by a gentleman in Muskoka that they cannot find the wild grape there at all. The cultivation of the hardy sorts of grapes can be carried on in almost all parts of Canada. The consumption of grapes at present is almost entirely for table purposes. My impression is that we are just in the infancy of grape culture; we have not yet attained complete success with either table or wine grapes. The best kind of grapes for wine-making are the Clinton and its derivatives.

Method of Cultivation.

To Mr. Brown.—I have no particular mode of cultivation besides the ordinary modes; I have nothing occult in my methods. I think the usual distance apart at which vines are planted in the rows is about twelve feet, and the rows of vines about sixteen feet apart. I don't know that I can tell you the average product per plant, but I should think that twenty or twenty-five pounds of grapes per vine is about the average, when they are planted so closely. I should think that if the product was much beyond that there would be danger of impairing the strength of the vine.

To Mr. Dymond.—In Canada we grow the vines either trained to a pole or trellised. In California they do as in France—grow them to a stump. I don't see any particular advantage in the latter mode. The vine grown in France is an entirely different kind of grape from ours, and I am inclined to think they are more readily grown in that form. I think they naturally grow more stocky and tree-like than ours. In California it is foreign grapes—which can be grown there with success—that are grown in that way. They are not subject to mildew there, but it is amongst those vines that the phylloxera is working so much havoc in California.

Amateur Varieties of Grapes.

To the Chairman.—For amateur growth I would take the Delaware. I should also like to grow some of the Crevelling. It requires to be grown with some care. It should be planted where it will get abundance of pollen from other varieties. The grape is of fine quality, and ripens early. I also like the Massasoit for an early variety. The Wilder is another, a black grape. The Agawam is a favourite of mine, because of its peculiar musky flavour. It comes the nearest to the Muscat of any of our grapes. We cannot usually ripen the Catawba here. I know of a large number of seedling grapes that are not in general cultivation, and some of them promise to be good. There is one known as Moore's Early, which was originated by John B. Moore, of Concord, Massachusetts, from seed of the Concord grape. It promises to be a valuable early grape. How hardy it will prove can only be known when it has been tried. There are two or three white grapes which promise to be of value. One is called the Prentiss, another the Niagara, another the Duchess, and another the Pocklington. They are all candidates for popular favour. As to preparing the ground for planting the grape, I would do it as for a field of corn—have it in good heart, and see that it is well drained.

[*Mr. Beadle.*]

Fertilizers.

To Mr. Brown.—I have little faith in special fertilizers. Grapes should be fed very little with the rank manures; bone-dust is better. If manures are used they should be well decayed. Bone-dust is an excellent fertilizer for fruits of any kind, and especially small fruits.

To Mr. Dymond.—I don't think the exportation of our grapes to foreign countries has been attempted. I doubt if the Concord grapes, if they could be exported, could compete with the European grapes. It is possible that we could export them with our quick steam transit.

MR. P. C. DEMPSEY'S EVIDENCE.

Extract from evidence on Fruit Growing and Forestry by Mr. P. C. Dempsey, of Albury, Prince Edward County.

Grape Growing—Successful Varieties.

We grow some varieties of grapes very successfully. The variety that succeeds best is the Delaware, and it appears to be one of the most profitable for market and for home consumption. We grow the Concord to a considerable extent. The Delaware brings about double the price of the Concord. If I were planting a vineyard I would limit myself to these two varieties. I have planted a good many of Rogers' red varieties on account of the high prices they command; red and white grapes have commanded about double the price of black grapes for the last two years. The first grapes we get on the market are the Champion and the Hartford Prolific, and they really destroy the taste of the people. Most of them have been accustomed to growing wild grapes. Those two varieties are not much in advance upon the wild grape. The Champion grape commands a good price and sells readily. There have been very few on the market. They usually bring about twelve and a-half cents. I have not had much experience with the Brighton, having only fruited it once. I recommend Rogers' Nos. 3, 4, 9, 15, 22, and 44. I have raised large numbers of seedling grapes of my own from crosses. I have planted the Burnet and No. 25 largely. The latter is a white grape, a little late, but it ripened last year with us. I have fruited about twenty varieties of seedling grapes. We describe them as quickly as we ascertain that they are good for anything. Our highest number is 60, but it would not be possible to tell you how many I have fruited, as there are some intervening numbers that never fruited. In order to test a grape for its fruit, it should be fruited more than one year, as sometimes it will be very superior the first year and yet fail the next year. They don't generally show their best points at first, but may gradually develop afterwards. In my experience that remark applies to other seedling fruits besides grapes. I have never discovered any disease in the roots and very little in the leaf. We had the mildew last year to a considerable extent on some of Rogers' hybrids and Allan's hybrids, and it extended even to a Martha which stood close to Allan's hybrid. I never saw the fruit rot on the vine except a few specimens last year; indeed it could scarcely be called rot. it was rather that the fruit seemed to cease growing. Insect enemies do not damage our grapes to any extent worth speaking of; the robins, however, are very destructive.

Progress in Grape Culture—Wine Making.

I don't think we have attained to anything like perfection in grape culture, having regard to its possibilities. I have not obtained a grape which in all respects I would regard as a choice wine grape. The progress that has been made in that direction leads me to suppose that we may succeed in getting one. The grapes I raise are for table purposes, though several gentlemen in my neighbourhood raise grapes to manufacture wine. The

Clinton is almost exclusively used for making wine. I tasted some of the wine, and it seemed to me to have more of the flavour of rhubarb than of grapes. One gentleman says he finds it profitable to make wine; he sells it at $2 a gallon, but I don't know where he gets a market for it. It is ten or eleven years since I tasted the wine to which I have referred, and it may have been improved since. I do not claim to be a judge of wine.

MR. BEALL'S EVIDENCE.

Extract from evidence on Fruit Growing and Forestry, by Mr. Beall, of Lindsay.

Grape Culture in the Lindsay District.

To the Chairman.—As to grapes, the Delaware, the Concord, the Clinton, the Crevelling, the Rogers' Nos. 4 and 15, and the Champion, have all been grown in our neighbourhood, and have fruited. They do much better than any other varieties that I am aware of. The Concord, the Delaware and the Clinton, ripen the earliest. I do not like the Champion myself, and would not grow it. I agree with previous witnesses as to the pruning of grapes. I think they should be pruned in the fall and then pinched in the summer.

MR. ARNOLD'S EVIDENCE.

Extract from evidence on Fruit Growing and Forestry, by Mr. C. Arnold, of Paris

Grape Culture in Brant.

To the Chairman.—I cultivate grapes considerably. For home consumption and dessert purposes I esteem the Brant, Rogers' No. 3 and No. 15, and there are a number of Rogers' other seedlings which are very good, all strongly resembling each other. Then there is the Delaware, and the Canada, which is very good on account of its keeping qualities. I have a very high opinion of Burnet's grape from what I have seen of it in other localities. I think the Concord is perhaps the most profitable for market, because the public have little taste, and it looks well. I have raised a good many grapes by hybridization. The Brant is one of my hybrids Its parents are the Clinton and the Black St. Peter's. I place it first because it is earliest among the frost grape family. The grapes of this family hang until the frost comes, and they are improved rather than injured, while Fox grapes are injured by the frost. I do not think we have attained anything like perfection in the varieties of grapes which we have now. I am not positive as to whether Canada is likely to be a successful grape growing country, partly owing to the liability to the phylloxera. The ravages of the blue beetle also make it rather discouraging. I am satisfied that first-class wine can be made from the Canadian grown grapes, with the addition of some saccharine matter. There is nothing in the character of the soil or the location of our district to prevent us from growing all these varieties successfully.

Insects.

Insect pests are our only drawbacks. Immense vineyards have been planted out and neglected, so that grapes can be sold at from three to five cents per pound, and then would not pay for the cost of cultivation. There is another discouraging feature, that a man who makes a stuff which he calls wine will sell his fluid in preference to pure grape juice. There is no demand in our district for the grapes grown there; we could sell them readily at from three to five cents a pound, but I never offer to sell mine. I make them into

wine. At the present prices realized for grapes I do not think their culture is successful, that is for the sale of the grapes. If they could be made into wine, and the wine sold, it might be profitable.

Frosts.

The grape vine in our section sometimes suffers from late spring frosts. I have known the Fox grape family to have the flavour taken out by autumn frost.

Phylloxera

There is a disease affecting my vines which I think is the phylloxera. The roots are injured by something early in the fall, but the insects are so small that I cannot catch them. The young roots look as if the outer skin was all eaten off. I have never endeavoured to find out what the insect was by sending samples of the roots to experts, because I was not suspicious of it before, but I shall do so this fall.

Blue Flea Beetle.

There is a sort of rot which affects the fruit, and mildew affects both the leaves and the fruit. The blue flea beetle, which is about one-fourth of an inch long, bores right into the centre of the bud just as it begins to expand in the spring, and the result of its operations is that the leaves never expand. It spreads over the whole vine, laying its eggs. The insect lives a considerable part of the summer. This summer, though we had millions of the beetle, there is not a worm to be seen. I think the heavy wind and rain took them all off. They have been very destructive this year in our vicinity. The Clinton has suffered worse than any other. They have been prevalent for years back. They take refuge on the Virginia creepers near my house. The insect is a little steel blue beetle.

To Mr. Dymond.—The beetle burrows into the bud and lays its eggs in the first place. The buds on the vine come out before those on the Virginia creeper. There would be some hope of destroying them if everbody would take the pains. I have compared the accounts of the operations of the phylloxera elsewhere with my own experience, and the comparison leads me to believe that the insect to which I have referred is that insect. My crop of grapes under glass is also injured. The phylloxera attacks both root and leaf. It was only last fall when I suspected its presence.

To the Chairman.—There are no other insects which trouble us very seriously. There is a little insect which we find in the seed of the grape. It is found in the Clinton and in some of the others.

Robins.

The robins are particularly destructive to grapes. I have not a favourable word to say for the robin in the way of mitigating circumstances. There are no other birds which injure the grape crop to any extent.

To Mr. Dymond.—We have some sparrows, but they have shown no disposition to injury, only in frightening away other little birds.

MR. BUCKE'S EVIDENCE.

Extract from evidence on Fruit Growing and Forestry by Mr. P. E. Bucke, of Ottawa.

Grape Culture in the Ottawa District.

To the Chairman.—Grapes are being cultivated a good deal, though this culture is yet in its infancy, like that of other fruits. Any variety that will ripen before or at the time of the Concord will succeed with us, anything later will not do. The vine of the

grape being pliable, we lay it down and cover it with earth during winter, thus making as it were, an artificial isotherm for this fruit. A covering of from four to six inches of soil would not permit of a thermometer sinking below from 25° to 30° F. and prevents the sun's ray from making any rapid changes in a heat register; in fact, from experiments made during a season, it is found the range of the glass at the depth of one foot travelled over an interval of only 25° F. It will thus be seen that with our summer sun heat we could grow any tropical plant which can be protected by earth during winter and that will stand such a prolonged burial as almost seven months. Many experiments I have made with the peach shows that it will not allow of this treatment, and I am now engaged on experiments with the fig. The date at which the Concord ripens is from the 20th to 25th September. The men who have been most successful in grape culture have grown them on a dark shale soil, sloping to the south; but any dry soil will do, especially if it has a southern aspect. We have no surplus grapes, and there is a ready demand for all grown. The fruit is usually sold at from 10c. to 12½c. or 15c. per pound, and retail at from 15c. to 20c. per pound. I should say grape culture is profitable with us. White grapes sell highest, red next, and the black last. We never have any June frost on high ground. The only disease that has affected the grape vines is mildew. There is an insect that perforates the leaf, but I do not know what it is; it does not do a great deal of harm. The robins are very destructive to the grapes, and the wax wing, or cherry bird, to the raspberries.

To Mr. Dymond.—People continue to plant grapes. The Fruit Growers' Association of Ontario, by their efforts, have stimulated the growth of fruits generally more than anything else. Some private persons have made wine, but none has been made for sale. Frosts come upon us with considerable regularity about the end of September. The earliest are not always severe, only striking the top foliage. Sometimes we have the grapes hanging on the vines till the middle of October.

MR. ALLAN'S EVIDENCE.

Extract from evidence on fruit growing and forestry, by Mr. A. McD. Allan, of Goderich.

Grape Culture in Huron.

To the Chairman.—We grow a considerable amount of grapes in our district, though they are grown mostly by amateurs. All the common, hardy varieties, succeed pretty well with us, except, of course, the Catawba. The Concord and Delaware are preferred, as being the most profitable for market purposes. Grapes require a dry, rich loam, but succeed well in some of our gravelly soils. Thorough drainage is absolutely necessary for their success.

Local Demand.

We find a local demand for nearly all the grapes grown, but a few are shipped to Toronto, London, and other points. The average price ranges from six to ten cents per pound, wholesale. Grape culture is decidedly profitable in our district, and might be gone into on a large scale with advantage.

No Spring or Early Autumn Frosts.

We never have any trouble with either spring or autumn frosts along the lake shore, though inland they prevail to some extent. Our severe fall frost does not occur until November as a rule, though occasionally we have them late in October.

[*Mr. Allan.*]

Effects of Frost on Grapes.

With some varieties a slight frost is necessary, in order to make them worth anything; such as Arnold's Brant, which is useless until it gets a frost. All the varieties which are descended from the frost grape, are improved by frost, but such grapes as the Delaware are impaired by it.

Mildew.

We have no disease that affects the roots or leaves, except the mildew. I find that this year the Brant suffers worse from mildew than any others. I find it also on Rogers hybrids. I have only noticed it at all where there has been a lack of drainage and cultivation.

Vineyards.

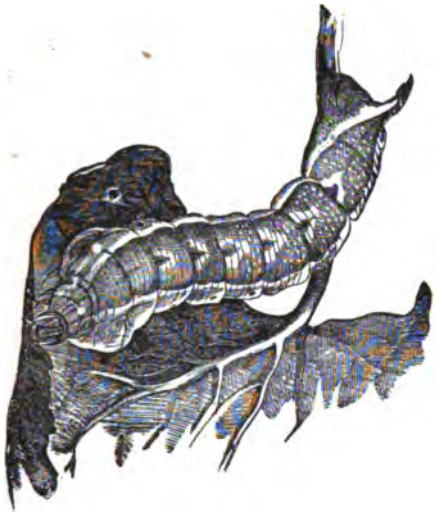
To Mr. Dymond.—We have no vineyards of a large size. About three acres is the largest we have. I have heard from time to time of people who said they were going into grape culture largely, but so far we have had no instances of the kind. They meant to with a view both of selling the grapes, and manufacturing them into wine. With us no wine is made for wholesale purposes. The area for the successful cultivation of the grape would extend inland for about four miles from the lake without danger of frost. I would limit our grape growing area to such a belt as that. We have frosts that cut off tender vegetables occasionally, but don't hurt grapes. Dusting with sulphur will prevent mildew. I have observed traces of rot in some of Rogers' grapes last year, but it was not general. As a rule, I prefer a south-eastern exposure for grapes.

Insects and Birds.

To the Chairman.—We have no insect that does serious damage to the vines. The thrip is the only one we have at all, and it does not amount to much as yet. The robins are destructive, but they are not so severe upon grapes as upon cherries. They are the only birds I have noticed at the grapes.

INSECTS INJURIOUS TO THE

GRAPE.



Green grape-vine Sphinx caterpillar (Chœrocampa pampinatrix).

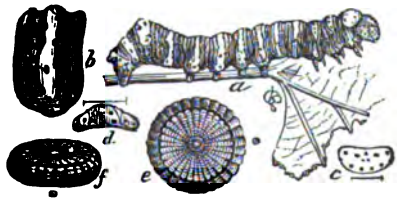
Cocoons of parasites covering the grape-vine caterpillar.

Moth of the grape-vine caterpillar.

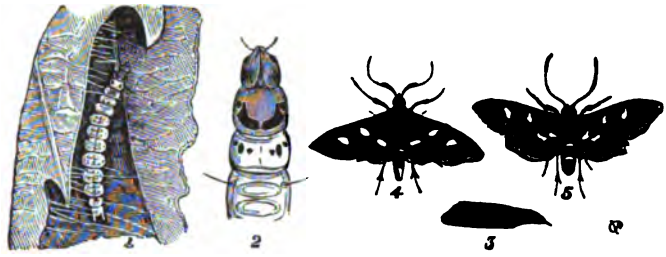
Beautiful Wood-nymph Moth (Eudryas grata).

The Thrip.

Pearl Wood-nymph Moth (Eudryas unio).



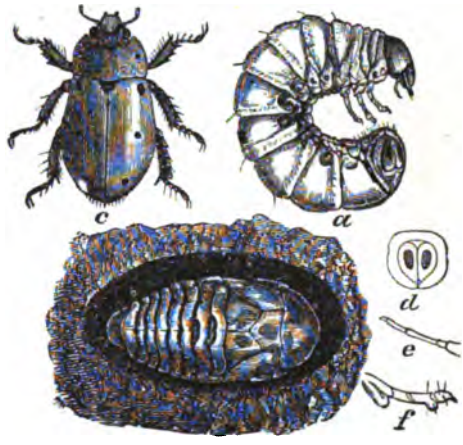
Larva and Eggs of Eudryas unio.



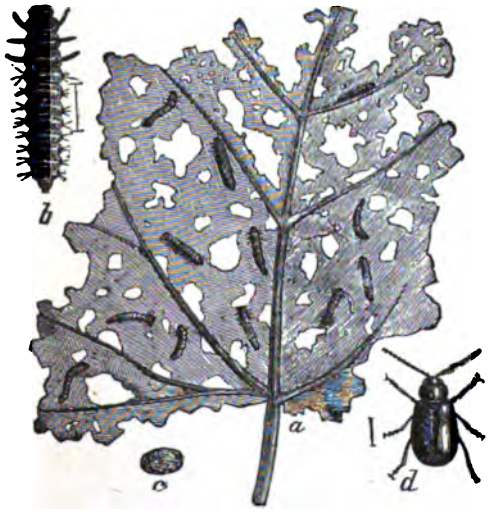
Moth and caterpillar of grape-vine leaf-roller (Desmia maculalis).

Grape-vine Plume Moth (Pterophorus periscelidactylus)—the insect in various stages.

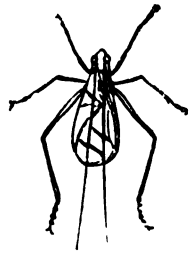
The Rose Beetle (Macrodactylus subspinosus).



The Spotted Pelidnota (Pelidnota punctata) or Spotted Grape-vine Beetle.—Larva, chrysalis and perfect insect.



Grape-vine Flea Beetle (Haltica chalybea)—*d*, beetle, *b*, larva; *c*, chrysalis; *a*, partly-eaten leaf.



The Tree Cricket (Œcanthus niveus), male.

The Tree Cricket (Œcanthus niveus), female.

ONTARIO AGRICULTURAL COMMISSION.

APPENDIX E.

EVIDENCE

RELATING TO

INSECTS AND INSECTIVOROUS BIRDS.

ONTARIO AGRICULTURAL COMMISSION.

APPENDIX E.

EVIDENCE

RELATING TO

INSECTS AND INSECTIVOROUS BIRDS.

Sittings to take oral evidence, held at London, July 20th, 1880. *Present*—Messrs. Saunders (Chairman), Dymond, and Gibson.

MR. WM. E. SAUNDERS' EVIDENCE.

Wm. E. Saunders was called and examined.

To the Chairman.—I have been engaged in the study of birds seven or eight years, and have paid particular attention to their nesting habits from the beginning of that period, and latterly to their food, which I have studied during the last two or three years. I have examined the crops of many birds—probably two hundred.

INSECTIVOROUS BIRDS.

Q.—Will you give us some idea of those birds which are purely insectivorous, and which are beneficial to the farmer and fruit grower by devouring injurious insects?

THE KING BIRD—THE PEEWEE.

Of the birds which take their food on the wing exclusively, there are, first, the fly-catchers, of which the king bird and the peewee are commonest. The food of these birds is chiefly flies. From evidences which I have seen in the stomachs of the king bird and peewee I consider them beneficial species, but to what extent I could only ascertain by determining the species of the insects which I found in their stomachs, and that I have not done.

THE NIGHT HAWK.

Moths are taken largely by night hawks, as these insects fly at night. Of some specimens of the night hawk, which I have examined, the chief food was the flying ant, but they feed principally on night-flying moths and flies, eating both in large quantities.

THE SWALLOWS.

Swallows take their food on the wing, and they live on pretty much the same insects that the fly-catchers do, only that most of the former take their food around barns and water, while the latter are to be found in the woods. These are the principal birds which take their food on the wing solely. Then there are those that eat partly on the wing, and partly take their food on trees.

BIRDS OF THE SECOND CLASS TAKING THEIR FOOD ON THE WING AND WHILE AT REST.

THE YELLOW WARBLER—THE REDSTART.

A.—The warblers are a very large family. The yellow warbler is the commonest, and the redstart is probably the next. These two take their food partially on the wing, but mostly on the branches of trees.

FOOD OF THE YELLOW WARBLER.

The yellow warbler is the commonest. Its food generally consists of the larvæ of moths, which they take from the leaves of trees. They also eat insects' eggs in considerable numbers, and occasionally they take insects on the wing, but not nearly so many as out on the branches of trees. They are very active birds, moving about a great deal after caterpillars on leaves and branches.

RED-EYED AND WARBLING VIREO.

There are other birds that live in the same way, as for example, the vireos. The commonest are the red-eyed vireo, and the warbling vireo. These birds I consider entirely insectivorous. They take a little food on the wing, but most of it they take very like the warblers, though varying towards the habits of woodpeckers and tits, as they climb around the trees and hang by their feet, head downwards, or almost any way. They have thus a better chance of finding the insects they are in search of than the warblers.

THE CUCKOO.

The cuckoos are similarly beneficial. They take their food almost entirely from trees. One bird which I shot, together with the young ones which I took from the nest, had their stomachs full of tent caterpillars. This was at the time when this caterpillar was very common.

THE BLUE BIRD.

The blue bird, I think, feeds altogether on insects, though it may take a few seeds when it cannot get enough insects. I would consider these birds of the second class more beneficial than those of the first, because the class of insects on which they feed are more injurious to the agriculturist than the others, taken on the whole.

THE NUTHATCH.

The nuthatch devours a great many insects. It is a very common bird, staying in this latitude all the year, and feeding almost entirely on insects. It pays no attention to posture when eating, and can take its food in almost any position. It devours a good many eggs of insects in the winter, and also chrysalids. It is particularly beneficial to

us on account of its remaining the whole year. When it does eat anything but insect food, it seems to prefer the beech nut. I have seen them hiding beech nuts in the cracks of logs or in the holes of trees, apparently for winter use. Its name originated in England.

THE WOODPECKER FAMILY.

The woodpecker family take their food mostly from trees. The most common varieties here are four in number—the high-holder, the red-headed woodpecker, the hairy woodpecker, and downy woodpecker,

THE RED-HEADED WOODPECKER A FRUIT EATER.

The commonest by far in this section is the red-headed woodpecker, and it is beginning to be generally considered injurious, principally on account of its habit of destroying so much fruit. It does not feed entirely upon insects—in fact, where there is fruit to be had, it prefers it. The fruits which I have found in their crops are chiefly cherries and apples. On the whole, I have not studied them sufficiently to give an opinion as to whether they are injurious or beneficial, but where they are abundant I should certainly say they were injurious on account of their destroying so much fruit.

UNWORTHY OF PROTECTION.

I don't think the law should protect them so stringently that parties should not be allowed to shoot them, if they think it necessary to do so, for the protection of their crops.

THE HIGH-HOLDER.

The high-holder takes a few cherries, but I have never seen it eat apples, nor have I found them in its crop. It does not take very many cherries either, and I think the good it does, in devouring insects, far more than compensates for any damage it may commit during the fruit season.

HAIRY AND DOWNY WOODPECKERS.

The hairy and downy woodpeckers are called sap-suckers, though there is very little satisfactory foundation for the idea that they injure trees by sucking the sap. The nuthatch and yellow-bellied woodpeckers are generally included in the same category. The last named is perhaps injurious in that respect.

NO INJURY TO TREES.

I have never seen any injury done to trees from the punctures made by these birds, and the trees upon which they have been operating generally appear to be perfectly healthy. From the number of holes which they make in the tree, I should say that if their purpose were to obtain sap the trees would die. I think that these classes of birds, with perhaps the exception of the red-headed woodpecker, are, on the whole, beneficial.

BIRDS OF THE THIRD CLASS—GROUND FEEDERS.

The third class consists of those which take their food on the ground. The high-holder takes considerable food on the ground, but of what kind I have not been able to ascertain; but as a rule, the birds which I have mentioned do not take anything on the ground.

[*Mr. W. E. Saunders.*]

THE THRUSH FAMILY.

Among those in the third class are thrushes; the most common being the robin, tawny thrush, brown thrush, and the cat bird. I have never seen them taking their food on trees.

THE ROBIN.

From my examination of the stomach of the robin, I have not very much to say in its favour. Out of perhaps twelve to twenty stomachs which I have examined, only about one-third to one-fourth were found to contain insects in any large numbers, and those only at a time when they could not obtain fruit. The insects were chiefly *coleoptera*. I also found quite a large number of earth worms. When they cannot get fruit, I should say that their softer food is chiefly earth worms. I do not remember finding any caterpillars in their crops, though more thorough search might reveal them. This spring we had a great abundance of a brown grub, called the cut worm, which is very destructive to early crops, but I never found one of them in the robin's stomach.

A DESTROYER OF BENEFICIAL INSECTS.

Of the beetles of which I found fragments in their stomachs, I recognized several times specimens of the *Carabidæ*, which are very beneficial by feeding on injurious insects.

RATHER INJURIOUS THAN BENEFICIAL.

I have not made sufficient examination to enable me to form a very decided opinion, but, so far as my observation goes, I should say that the robin should not be protected, as it is rather an injurious bird than otherwise.

FRUIT PREFERRED WHEN ACCESSIBLE.

To Mr. Dymond.—At the time when the robin was feeding on fruit I found a small portion of insect remains in their stomachs—perhaps about ten per cent.; but when they can get fruit, especially cherries, they prefer it.

MISCHIEF TO CHERRIES AND RASPBERRIES.

I have noticed extensive mischief done by them when they are numerous, especially to cherries, of which, between them and the cherry bird, not half a crop was gathered. They feed largely, too, on raspberries, when that fruit is in season, and the cat bird also eats raspberries. It belongs to the thrush family. They do not attack strawberries very much, probably because they are not so easily discovered and eaten as the raspberry and cherry. I have not made particular inquiry as to the birds that are considered injurious in districts where strawberries are cultivated. My inquiries have been largely confined to this district. I have not noticed that the robin has increased largely of late years.

THE LAW OFTEN DISREGARDED.

Though fear of the law protects the robin in many cases, a good many people disregard the statute, and shoot them when they find them destructive.

ATTACKS ON THE GRAPE VINES.

They eat grapes in large quantities. Late in the fall I have seen flocks of two or three hundred robins on the Clinton grapes. It is a migratory bird, though there are a

few stragglers left in winter. Probably these are the robins which have spent their summer farther north.

LEAVE THE ROBIN TO HIS FATE.

Balancing their advantages and disadvantages, I think, on the whole, the robin should be left to his fate, without any interference by law, either for his protection or destruction. I don't find that the robin eats apples, and where that fruit only is cultivated he may be an innocent bird.

TAWNY AND BROWN THRUSHES.

To the Chairman.—The tawny and brown thrushes are sufficiently common to be of importance to the fruit grower and farmer. They don't inhabit the orchard much, but take their food chiefly on the ground in the woods.

MOSTLY INSECTIVOROUS.

They are almost altogether insectivorous. They chiefly devour beetles, though they also eat a few larvæ.

THE CAT BIRD.

The cat bird, which is very common, belongs to the same family. It is chiefly, but not wholly insectivorous. The only fruit which I have noticed it take is the raspberry, and the birds do not infest them sufficiently to be considered injurious.

GENERALLY BENEFICIAL.

I consider it a beneficial bird, as I do the thrushes generally.

THE BLACKBIRD FAMILY.

We have another class of birds known as the blackbird family, comprising the red-winged blackbird, the crow blackbird, the cow bird, the meadow lark and oriole. They are all ground feeders, except the oriole, which feeds largely on trees.

THEIR FOOD.

The food of these birds consists largely of the larvæ of beetles, as well as the mature insects. I took a few crow blackbirds the other day, and found that they had been living almost entirely on rye and barley. In fact I was unable to find anything else in their stomachs. I regard them as only partially insectivorous.

THE RED WINGED AND CROW BLACKBIRDS DESTRUCTIVE IN LARGE FLOCKS.

In districts like this, where it is not very numerous, I should say that the crow blackbird is beneficial, but where it appears in large flocks, it, as well as the red-winged blackbird, is very destructive. I find that this was the case in the early settlements of the country, when they were very numerous.

THE COW BIRD INJURIOUS.

The cowbird, like the cuckoo of Europe, lays its eggs in other birds' nests, and I should say that it is decidedly injurious, because it generally selects the nests of small birds, such as the sparrows, the warblers, and occasionally the tawny thrush.

[*Mr. W. E. Saunders.*]

INTRUSIVE HABITS.

The young of the cow bird are generally larger than those of the bird in whose nest its eggs are laid, and being more clamorous for food, as well as larger, the result generally is that the rightful tenants of the nest die of starvation. In fact, I have never been able to find young cow birds of large size along with the young of their foster parents, though the two kinds of eggs are found in the same nest. I attribute this to the fact that the intruders absorb the entire attention of the foster mother. The dead birds are generally carried away to a distance. On account of these habits I should say that the cow bird is decidedly injurious. The cow bird generally lays only one egg in a nest, but as I have found nests with two eggs of the owner, and five of the cow bird, I should judge that the latter were laid by different birds. I have no idea that the cow bird compensates us in any way for its destruction of insectivorous birds, though perhaps one-half of its food consists of insects.

THE RED-WINGED BLACKBIRD.

The red-winged blackbird feeds upon larvæ, chiefly of beetles, in the spring, and in the fall it devours grain. They have been known to do serious injury to grain crops, but they are not numerous enough here to merit much attention.

THE MEADOW LARK A BENEFICIAL BIRD.

With regard to the meadow lark, it takes its food, which consists chiefly of beetles on the ground. Out of a number which I shot a short time ago, I found that they had taken perhaps about 25 per cent. of beetles, the remainder being vegetable food, but of what kind I could not determine. They sometimes devour grasshoppers. The larvæ which they eat are principally those of beetles. I should say that it was a beneficial bird, because it troubles crops very little indeed. I don't know that I have ever heard any complaints against it.

THE BALTIMORE ORIOLE A BENEFICIAL BIRD.

The Baltimore oriole is a beneficial bird. It takes its food largely on trees, and to some extent on the ground. Except in the fall, it takes very little insect food. The meadow lark is not very closely allied with others of the blackbird family, but is put in a sub-family.

THE SPARROW FAMILY.

The sparrows feed almost entirely on the ground. The song sparrow is one of the first birds that return to us in the spring. The black snow bird also belongs to the sparrow family.

DISTINGUISHING CHARACTERISTICS.

Sparrows are distinguished most easily from the warblers by having short, pointed, strong beaks, whereas those of the warblers are slender. The sparrows are all pretty much grain feeders.

THE INDIGO BIRD.

In the stomach of the indigo bird, which is a sparrow, I have found nothing but seeds.

THE SONG SPARROW.

The food of the song sparrow consists largely of insects, especially in the spring. Like the vast majority of birds, they feed their young on insects, the latter seeming to

require insect food. In the fall they generally go in small scattered flocks, subsisting chiefly on small seeds, etc.

THE GRASS FINCH.

The grass finch is a very common sparrow. It builds its nest on the ground, and its habits and food are similar to those of the song sparrow.

THE GRAY BIRD OR CHIPPING SPARROW—A BENEFICIAL SPECIES.

The gray bird or chipping sparrow is very common. It is more exclusively insectivorous than any of the others. It seems to feed largely on insects, even in cities, where it could get scraps thrown from the houses and other food of that kind. I would regard it as a very beneficial species. I find that the sparrows feed largely on *larvæ*, sometimes taking their food in trees, but not often. Generally their food consists of the *larvæ* of beetles and moths which they can pick from the ground. This remark applies to all species of sparrows.

THE CHEWINK.

The chewink is essentially a ground feeder, and never takes anything from the trees. It has a habit of scratching the ground for its food like the barnyard fowl. It is a moderately common bird. As it confines itself mainly to the woods, seldom appearing in the clearings, I would not consider it of great benefit to the agriculturist.

THE PURPLE FINCH.

The purple finch is very common in winter. It is one of the birds which are supposed to be injurious, as it feeds largely on the buds of trees. From my examination of the stomach of this species I think that opinion is well founded, and I consider it an injurious bird. The indigo bird does not do any good that I know of, except perhaps, in rearing its young it feeds partially on insects. The character of its ground food is such that it has no chance to be injurious, as it eats chiefly the seeds of grass and weeds. I never found any of the cereals in its stomach.

THE BLACK SNOW BIRD.

The food of the black snow bird is much the same as that of the song sparrow, except that it takes its food more in the woods than the sparrow does. Its food would be fully one half insects, except in winter, when it takes a good many seeds.

THE LARK SPECIES.

To Mr. Gibson.—The Chewink is allied to the lark species, but not closely, and is placed in a sub-family among sparrows. I have heard that blackbirds are destructive to Indian corn, but I have never detected them feeding upon it.

THE ENGLISH SPARROW.

To Mr. Dymond.—I have not had very much opportunity of noticing the English sparrow. It seems to feed about equally on insects and seeds. They can be noticed picking up seeds on the streets, largely grain, which they find in horse-droppings. I have not examined their stomachs.

DOUBTFUL FRIENDS.

In England they are supposed to devour a great deal of insect life, but it is doubtful whether that benefit is not more than counterbalanced by the grain and fruit they devour.

[*Mr. W. E. Saunders.*]

A PREMIUM ON THEIR HEADS.

At one time, in Germany, a premium was paid for their heads, and they were almost exterminated in that country. They were of precisely the same species which we have recently imported into Canada. In Germany, after they were nearly exterminated, the people found that insects increased so much that they had to import them. I should think that the birds found in Germany would be about equally insectivorous with ours.

A DISPUTED POINT.

In England it is a disputed point whether it is an injurious or a beneficial bird. The weight of testimony seems to be about equally divided. There has been a great de of controversy on the subject, both here and in the United States.

NOT PUGNACIOUS.

I have not noticed that the English sparrow is particularly pugnacious, or that it destroys the bluebirds' nests. I noticed, however, that places where the white-bellied swallow used to breed every year were, this year, taken possession of by the sparrow. I could not say that the number of swallows has been affected by the importation of the sparrow.

THE SWALLOW WHOLLY INSECTIVOROUS.

The swallow's food is wholly insectivorous. Of course, when I speak of a bird as being insectivorous, it is not necessarily beneficial, as it may devour insects which are themselves beneficial by destroying those of an injurious character. On the whole, I think insectivorous birds are of benefit to farmers and fruit growers.

DEVOURING FRIENDS AND FOES.

I read a paragraph in an American paper lately about the thrush family, which, if true, would greatly lessen their value. It mentioned the catbird especially, and said that in the vicinity referred to it ate so many beneficial insects as almost to destroy its usefulness.

THE CANARY MOSTLY A GRAIN FEEDER.

To the Chairman.—With regard to the bird commonly known as the canary, it is very common, and is chiefly a grain feeder, though it feeds its young partially on insects. When I speak of its being a grain feeder, I mean that it devours small seeds, and not valuable grain. When it is seen on the thistle it is usually gathering the down to build its nest. The grain which it devours is not of sufficient value to warrant anything being said against it on that account. I do not think that the existence of the canary would have much effect in lessening the number of weeds.

To Mr. Gibson.—I don't think the canary is particularly fond of garden seeds.

THE SHORE LARK.

To the Chairman.—The shore lark formerly belonged to the same *genus* as the sky lark, but lately it has been separated from it. It is a pretty common bird, but I have not paid much attention to its habits. It is usually considered insectivorous, though, in the winter, it eats a great many seeds.

THE HOUSE WREN.

I should say that the house wren is beneficial. I have never found it eating anything but insects, chiefly larvæ. It takes its food on trees far more than on the ground. The larvæ which it devours are generally those of butterflies and moths.

[*Mr. W. E. Saunders.*]

THE BLACK-CAPPED TIT, OR CHICKADEE.

The black-capped tit, commonly known as the chickadee, is entirely beneficial. I don't think it ever eats anything but insects. It is very active, and continually in search of insects, their eggs, and chrysalids. It does not remain commonly with us in the summer.

ONE OF THE MOST BENEFICIAL.

I put it among the most beneficial of our birds, because its food consists so largely of eggs taken in winter, when a great many must be devoured, because they are so small that a large number would be required to satisfy the needs of the bird.

THE KINGLETS.

The same might be said of the kinglets, which are also winter birds. They belong to a family of their own, and are generally found in company with the chickadees.

THE AMERICAN CREEPER.

The American creeper is not very common here, and restricts itself chiefly to the woods. So far as it goes it is beneficial, as it devours the eggs and larvæ of insects noxious to forest trees.

THE WAXWING AN INJURIOUS BIRD.

I have never found the waxwing feeding on insects. Most birds feed their young on insects, but I am not sure with regard to it, and am rather inclined to think that insect food forms a very small proportion of its diet, because, just as soon as the young can fly from the nest, they go to the late cherry trees and devour fruit. On the whole, I regard it as an injurious bird.

THE BUTCHER BIRD.

I am informed that the butcher bird kills the sparrow in the United States, but I have never noticed it doing so here, though I believe it lives almost entirely upon small birds, and would regard it as decidedly injurious on that account.

THE CROW BLACKBIRD.

I forgot to say, when speaking of the blackbirds, that the crow blackbird is considered, in some districts, to be very destructive to smaller birds by eating their eggs. I have not noticed it doing so, but I have noticed that the smaller birds have a great antipathy to it.

THE JAY.

The jay feeds largely on the eggs and young of birds, and eats enough of them to be decidedly injurious.

To Mr. Gibson.—I have not known the jay to take hens' eggs from the barn-yard.

THE SNOWBIRD.

To the Chairman.—The snowbird does not remain in summer with us, though it is very common in winter. In summer it goes to Labrador and the North-West Territories. Its food, I think, is chiefly small seeds, such as those of clover and pigeon grass. I don't consider it as injurious or particularly beneficial, for it has no chance to be either one or the other.

[*Mr. W. E. Saunders.*]

THE CROW A GRAIN FEEDER.

With regard to the crow, I have not examined many specimens, but from those which I have examined, I find that the bulk of its food consists of grain. I have found it eating corn, barley, and wheat. I found a few larvæ in the stomach of one, but when it does eat insect food, it consists generally of matured beetles. The proportion of its insect food to the whole, would be in the spring and early summer from 25 to 50 per cent.; but when the grain comes in it would not be more than from 10 to 20 per cent.

To Mr. Dymond.—It would be in the early portion of the year that the destruction of insects would be most useful. After the spring, the birds have not so much chance to eat insects, because the larvæ are not so abundant. In the fall they would, of course, be almost as beneficial, because their destruction of insects would affect next year's crops. The crow which I speak of—the one which we find in this country—is not the same as the English crow, though it is closely allied.

NO BIRD TO EAT THE CODLIN WORM.

To the Chairman.—I have found no bird that eats the codlin worm. I should think, from their habits, that the birds most likely to be beneficial by eating it would be the woodpeckers and nuthatches, though the warblers would probably eat a good many. I think it is probable that many are destroyed in that way every year.

CURCULIO AND POTATO BEETLE.

I have not found any bird eating the plum curculio or the potato bettle.

THE BORERS DEVOURED.

The borers in fruit and forest trees are chiefly devoured by woodpeckers and nuthatches. They form the greater portion of the woodpecker's food.

THE PURPLE FINCH.

The purple finch is, I think, the most injurious to the buds of trees.

THE CHERRY BIRD.

The cherry bird feeds largely on blossoms, but I never found it eating buds.

THE SPARROW.

To Mr. Dymond.—I have never found the sparrow eating the buds of fruit trees.

To the Chairman.—From what I have seen and heard of the English sparrow, I think its introduction into this country would be beneficial in the cities, but not in the rural districts. That seems to be the general feeling in Europe and the United States. It seems to prefer the city, but, of course, when the cities get a certain number, some of them go to the country.

To Mr. Dymond.—To judge by the shape of his bill, I would think that the sparrow would be graminivorous, rather than insectivorous.

FOOD OF THE ORIOLE.

To the Chairman.—The oriole feeds somewhat on raspberries and cherries, but not to any great extent.

[*Mr. W. E. Saunders.*]

THE SCARLET TANAGER.

The scarlet tanager I have not observed very much, but I remember examining the stomach of one in the spring, and I found its food entirely insectivorous, so I think it would be a useful bird. It does not occur in large enough numbers to affect the agriculturist to any appreciable extent.

THE YELLOW-BELLIED WOODPECKER.

To Mr. Gibson.—The yellow-bellied woodpecker does not breed commonly in this section.

THE CROSSBILL.

To the Chairman.—The crossbill has been found breeding in Canada, and the State of Maine, even in the depth of winter. In the northern parts of the country it also breeds in summer.

CARNIVOROUS BIRDS.

Of the carnivorous birds, some are far more injurious than others. We have three or four common species of hawks, and of those, all I have examined, except the sparrow hawk, are exceedingly injurious by devouring a great many small birds.

THE SPARROW HAWK.

The sparrow hawk does not seem to take so many, though it takes them in sufficient numbers to make it injurious. The sparrow hawk is common.

THE RED-SHOULDERED HAWK.

The red shouldered hawk is the commonest of the large varieties, and is sufficiently common to be considered decidedly injurious. In the wilder portions of the country, where hawks are numerous, I don't know that the smaller birds are less numerous than here. There is a tendency toward the diminution of the larger birds as settlement increases, but I don't know that there is so much difference with regard to the smaller birds. Blackbirds have very greatly decreased in number during the last century.

THE OWLS.

I have not had much opportunity of examining the habits of owls, but I should think the small owls would be rather beneficial, their food consisting largely of mice and other small animals rather than birds.

NO PROTECTION TO CARNIVOROUS BIRDS.

To Mr. Dymond.—Carnivorous birds are not protected by Act of Parliament, but all other birds, I think, are protected indiscriminately. A good deal of harm might be done by allowing mice-killing birds, for instance, to be shot. Owls are not shot very much, because they are so retiring. Hawks chiefly prey on other birds, catching them on the wing, so I do not think they should be protected. The jay devours adult birds as well as those in the nest, so I think it should not be protected.

LEGISLATING IN THE DARK.

Ornithology has not made much progress in Canada, and our legislation on the subject of birds has been rather in the dark.

[*Mr. W. E. Saunders.*]

To the Chairman.—To anyone who has been in the habit of studying birds in nature, there would be no difficulty in preparing a comparatively correct list of those birds which should be protected, and those which should not.

DIFFICULTIES OF CLASSIFICATION.

With reference to protective legislation on birds, there might be an intelligent classification of the information at present possessed, but I don't think the classification would have much effect. For example, the female of the purple finch, as well as its young, looks very much like the gray birds or sparrows, and one is injurious and the other beneficial; and as not one person in a thousand could tell the difference, the useful bird would be as likely to be destroyed as the other. Of course there would be no such difficulty with regard to the robin, the blue jay or the cherry bird.

BIRDS TO BE EXCEPTED FROM PROTECTION.

To Mr. Dymond.—I think some classification might be made, though probably it would not be complete. I would leave out of the list of protected birds, the robin, blue jay, cherry bird, red-headed woodpecker, and the blackbird; or rather, with regard to the cherry bird, blue jay, robin, crow, crow blackbird, and the cow bird, I would go further, and endeavour to promote their destruction.

NEED FOR MORE INFORMATION.

There is no association for the study of ornithology in Canada. The Entomological Society deals with the question incidentally.

To the Chairman.—I would have no difficulty in determining the insects which I find in the stomachs of birds, if I could have large enough fragments, but they are often broken into such small pieces that it is almost impossible to distinguish them. It would be very uncertain ground to go upon to make out such a list, merely from observation of the habits or actions of birds, without examining their stomachs.

THE KING BIRD—A BEE EATER.

To Mr. Gibson.—The king bird I would consider beneficial, though it is said to eat bees. Any damage it does in that way is amply compensated for by its destruction of injurious insects. It is sometimes called the "bee martin." In this section bees are not sufficiently reared to permit of much damage being done in that way.

MORE MIGRATORY BIRDS.

To Mr. Dymond.—Nearly all of the woodpeckers remain in Canada during the winter. The nuthatches, and some of the sparrows, the cherry bird, and the carnivorous birds remain during the winter, though they are not so common as in summer. The woodpeckers eat hardly anything but insects, even in winter, but the sparrows get no insects that I know of in winter, on account of the ground being covered with snow.

INVESTIGATION IN THE STATES.

To ascertain the food of these birds, and institute comparisons between them would require investigation for a long time by Ornithological and Entomological Societies. I think such observations would be very profitable. It has not been done efficiently up to the present time in the United States, though private individuals have made pretty thorough investigations. Our birds would be largely the same as those in the Northern States.

[*Mr. W. E. Saunders.*]

THE BOB-O-LINK.

To the Chairman.—There is a bird called the rice-bird shot very commonly in the south during the winter. It is known here as the bob-o-link, and belongs to the black-bird family. It feeds on insects in the spring, but in the south it is said to be very injurious to the crops in the autumn. Here it is not abundant enough to warrant its being called injurious.

To Mr. Dymond.—Tits, I believe, are exceedingly useful by destroying insects.

THE CARDINAL GROSBEAK.

To Mr. Gibson.—We do not have the cardinal grosbeak in this section at all, but they are found west and south of this. From the character of their bills I should think they would be largely seed-eaters.

HABITS OF THE CROW.

The crow is addicted to the eating of the eggs of smaller birds. I have only heard of its eating eggs, but I have seen it flying away with young birds.

WILLIAM E. SAUNDERS.

MR. WILLIAM BRODIE'S EVIDENCE.

Sittings to take oral evidence, held at Toronto, October 4th, 1880. *Present*—Messrs. SAUNDERS (Chairman), and DYMOND.

WILLIAM BRODIE, called and examined.

I have paid considerable attention to insectivorous birds and their habits. I may say I have been giving the matter attention for the last thirty years. I have noted during that time the special relation of bird to insect life.

INSECTIVOROUS BIRDS.

I have found the following birds to be insectivorous at all times, viz:—Paridæ (tit-mice), Sittidæ (nut-hatches), Certhiidæ (creepers). From my personal acquaintance with these birds I believe they are insectivorous at all times. The Sylvicolidæ (warblers), are generally insectivorous, but there are some exceptions; some species are grain-eaters at certain seasons of the year.

POST MORTEM EXAMINATIONS.

For many years past, whenever a bird came into my possession, I made a special point of examining the stomach, and I have kept pretty full notes. Swallows also are insectivorous at all times, as are also the Tyrannidæ (fly-catchers), and Caprimulgidæ (goat-suckers). In this last class are included the whip-poor-will, and the night-hawk. The Picidæ (woodpeckers) are insectivorous, with a few exceptions,

DAMAGE TO FRUIT.

Woodpeckers are injurious to cherries and sweet apples, when these fruits are ripe. Some time ago, in Whitchurch, there was great difficulty in keeping sweet apples from

being destroyed by woodpeckers. I think that the apple attacked at that time was natural fruit, a seedling. The orders I have mentioned comprise the birds that are insectivorous at all times.

PARTIALLY INSECTIVOROUS BIRDS.

The following birds are insectivorous at breeding times :—Thrushes, blue-birds, wrens and sparrows.

SPRING FOOD OF THE BIRDS.

In spring, when birds first come over, they feed on ants pretty largely. I have found ants in their stomachs in almost every case in early spring, and the larvæ of scavenger diptera. I have found in the stomachs also the larvæ of scavenger beetles, such as are usually found in dung ; and the fragments of mature insects. I don't think that I have observed that any particular family of birds are partial to any particular family of insects.

THE CUCKOO EATING GRASSHOPPERS.

There is the cuckoo, which I find feeds very largely on grasshoppers.

THE CODLING-WORM AND TENT-CATERPILLAR.

I have never known any birds to feed on the tent-caterpillars. I have known of birds feeding on the codling-worm. I think it may be said that the creepers and warblers do. I can't say I have found the codling-worm in the stomach of any bird. I have observed birds searching for them. The chief difficulty is that they are not to be found during the principal part of their larval life ; they are only seen when coming down the tree, and this they usually do at night. Those that pupate on the bark of the tree are preyed upon by the woodpecker.

THE CURCULIO AND POTATO BEETLE.

I do not know of any bird that is especially destructive to the plum curculio. I do not know of any domestic fowl or wild bird that feeds on the potato beetle.

THE NATIVE SPARROWS.

I have found sparrows feeding on the larvæ of the cabbage butterfly. The particular species I allude to is the tree sparrow. I saw two or three in the garden feeding on larvæ, and I afterwards killed one and found three larvæ in its stomach. This is the only case I have known of a bird preying on the larvæ of the cabbage butterfly.

BIRDS THAT DEVOUR BORERS AND EGGS OF INSECTS.

The birds that specially devour borers in fruit and forest trees are woodpeckers and nuthatches. The birds that devour the eggs of insects that I know of are nuthatches, creepers, and titmice. During the breeding season birds generally feed on larvæ. My experience has been that the young birds are fed on larvæ.

BIRDS THAT FEED ON PUPÆ.

Woodpeckers, as well as other insectivorous birds, feed on pupæ of insects. I have found in a number of cases the cocoons of the Cecropia killed by woodpeckers In the fall of 1867 I collected in Whitchurch over a hundred Cecropia cocoons, and there were only three living among them. The others were all punctured by woodpeckers.

[*Mr. Brodie.*]

THE YELLOW-WINGED WOODPECKER—THE FLYCATCHER—THE ROBIN.

The pupæ of Arctians are preyed upon by the yellow-winged woodpecker. The genus I especially refer to is the Halesidota. The birds that specially devour insects in their perfect or winged state are the swallows, flycatchers and goatsuckers. I do not think the good robins do by destroying insects is an equivalent for the fruit destroyed by them.

THE BLUEBIRD.

The bluebird in early spring is a very general feeder. It feeds on grain pretty largely, on the seeds of the wild rose, ants, small beetles, and the larvæ of diptera.

THE FOOD OF THE ROBIN.

During the breeding season of the robins the young birds are fed with larvæ; in the early season and later in the season they are fruit eaters to a large extent. I got a few specimens sent to me the other day, and the necks were crammed with berries of the mountain ash, and I have often taken them with a couple or three cherries; usually there is only one, but I have got sometimes three. To a small extent I have found robins attacking earth-worms. I have found them especially fond of the elaters or wire-worms, such as they find in dung or other decaying vegetable matter. When robins attack larvæ during the breeding season they attack them for their young as well as for their own food.

THE WOODPECKER AND CHERRY BIRD DESTRUCTIVE.

The hairy woodpecker, the downy woodpecker, and the red-headed woodpecker are all objectionable, because they destroy fruit. The cherry bird does not eat any appreciable quantity of insects. My experience is that the food of cuckoos usually is grasshoppers and soft larvæ.

THE MEADOW LARK.

Meadow larks feed on grasshoppers, but, of course, there is other food which they eat. During the breeding season they feed largely on grasshoppers. The principal food of the catbird, during the breeding season, is small larvæ. In spring and autumn it is a general feeder similar to the other thrushes.

PIGEONS ATTACKING GRAIN CROPS.

Years ago, when the front counties were more densely wooded than now, considerable injury was done to grain crops, principally peas and wheat, by pigeons picking up the seed and feeding on the ripe grain.

GROSBEAKS AND CROWS.

Grosbeaks also feed to some extent on ripe wheat. Crows often feed on seed, peas and corn, when sprouting; they also destroy beneficial insects, such as *Ichneumons*, and beneficial reptiles, such as toads; they also often destroy young lambs, geese and ducks.

BIRDS NOT DESTRUCTIVE TO FRUIT BUDS.

I do not know that any birds are directly injurious to the buds of fruit trees. I am aware that many fruit growers charge cherry birds, orioles and grosbeaks with feeding on buds as well as on blossoms of fruit trees.

THE SPARROW DESTROYING FRUIT BLOSSOMS.

I know of no bird, except the English sparrow, directly injurious to fruit blossoms.

[*Mr. Brodie.*]

This recent importation has been found to destroy the fruit buds of the red currant and gooseberry.

BIRDS FEEDING ON RIPE FRUIT.

Robins, cedar birds, and woodpeckers, feed on ripe fruits. Apples, pears, cherries, gooseberries, raspberries, and grapes are generally selected; woodpeckers are especially fond of sweet apples. The insect food of the English sparrow is largely the larvæ of scavenger insects; its introduction will not benefit farmers nor fruit growers.

UTILITY OF BIRDS.

Q.—The objects you think to be gained by protecting birds would be three-fold—the protection of fruit, the protection of grain, and the diminution in the number of insects that are annoying to animal life—would that cover the uses of birds?

BIRDS INDISCRIMINATELY DESTRUCTIVE.

A.—I do not think that insectivorous birds are of any use in destroying injurious insects. All, excepting those which are nocturnal feeders, do injury in destroying useful insects such as ichneumons and scavengers. As the woods disappear, and as waste land becomes cultivated, birds disappear from us and are found in wooded sections, where cover for nesting is abundant and food plentiful. Again when crops in various sections of Ontario were destroyed by insects—where birds were as numerous as we can ever expect to have them—no appreciable good was reported from them. There are many reasons for protecting birds, squirrels, and other comparatively harmless animals, but I think it is a mistake to depend on birds to keep injurious insects in check.

PROTECTION TO NOCTURNAL FEEDERS.

Those insectivorous birds and reptiles which are nocturnal feeders should be protected for economic reasons. The toad, for instance, feeds on cut-worms, which on account of their nocturnal habits, are not so liable to the attacks of ichneumons. I would not advise the annulling of the law for the protection of birds. I would enlarge the list and include squirrels and toads. I do not think that any of our birds are strictly nocturnal feeders; the goatsuckers are more so than any other species, but in as far as they are day feeders they may be injurious.

THE SWALLOW NOT ALWAYS BENEFICIAL.

Beneficial insects generally fly during the day, and many of them pair on the wing, they are therefore preyed upon by swallows; in this particular swallows are not beneficial.

THE ICHNEUMON TRIBE.

In the order Hymenoptera we have the Ichneumonidæ, Proctorupidæ, Chalcididæ, and in Diptera the genus Tachina representing the carnivora of the insect world.

ENCOURAGEMENT TO BENEFICIAL INSECTS.

It is to this group we must look for protection to our crops from the attacks of injurious insects. This proposition is not new; methods based on it have been proposed by entomologists time and again, but I venture to say never fully put before the public. A great number of cases have been reported where destructive insects have been checked by ichneumons; perhaps wherever a decrease has occurred it has been caused by these neglected helps, by sudden changes of temperature, by heavy rains, or by other conditions of the weather inimical to the existence of the pests.

[*Mr. Brodie.*]

OVER 5,000 FRIENDLY SPECIES.

Over 5,000 species are known to science, a large proportion of which prey on plant-eating insects. Every entomologist is acquainted with some portion of the life-history and habits of the more common species, and knows that their hardiness, fecundity, and their ability to keep in check the species on which they prey, are very remarkable.

DESTRUCTION OF THE SWALLOW-TAIL BUTTERFLY.

Among many reported instances of injurious insects being brought to zero by parasites may be mentioned that of the swallow-tail butterfly, the larvæ of which in the summer of 1876 did considerable injury to celery, parsley, and other umbelliferous plants in the vicinity of Toronto. In 1877, the ichneumon, which preys on them—*Trogus exesorius*—became common, and gained on them, so that this last summer a large field could be searched without finding a larva.

THE HORSE-CHESTNUTS PROTECTED.

From 1865 to 1870 the larvæ of the *Apatela Americana* did serious injury to the horse-chestnut trees in and around Toronto; many of the trees were nearly denuded of leaves, and in the pupating season 100 larvæ could be collected in a morning walk; down the Queen street avenue, in the fall of 1870, two species of parasites—an *Ophion* and a *Tachina*—were found preying on them, and so speedily did they increase that in a large collection of *Apatela* larvæ collected in the autumn of 1879, 96 per cent. were found to be parasitised.

THE TUSSOCK-MOTH DESTROYED.

From 1870 to 1873 the Tussock-moth—*Orgyia leucostigma*—was very common in and around Toronto, Owen Sound, and other parts of Ontario; the larvæ feeding on the leaves of the horse-chestnut, maple and elm, did serious injury to these trees. They have been reduced by an ichneumon—a species of *Pteromalus*—so that during the past summer I have not seen one specimen.

WHY THE INSECTIVOROUS BIRDS ARE NOT BENEFICIAL.

It is while injurious insects are in the larvæ, or in the egg form, that they are devoured by parasites, and so in destroying injurious insects in the larva form, we destroy our friends along with our enemies. It is therefore obvious why insectivorous birds may not be beneficial, and why poisoning injurious insects, in the larva form, or destroying them in any other way, may be an evil instead of a benefit.

THE CASE OF SWALLOWS.

Q. You speak of swallows destroying some beneficial insects; don't they make amends by destroying injurious and annoying species? A. Perhaps so, but granting this, it is not a strong claim for their usefulness, and, although swallows are not larva eaters, they destroy parasitic insects in the imago form while on the wing.

DESTRUCTION OF THE CABBAGE BUTTERFLY AND OTHER PESTS.

Among the Lepidoptera, which have done marked injury to farm crops in the county of York, during the last thirty years, may be mentioned, the cabbage butterfly—*Pieris rapæ*—now nearly exterminated by an ichneumon, *Pteromalus puparum*—the codlin-moth—several species which in the larva form are familiarly known as cut-worms; the tent caterpillar, the currant-borer. Many years ago the native cabbage butterfly, *Pieris brassica*, did a good deal of injury to cabbage and Swedish turnip crops. For many years

they have been very rare, in fact exterminated in the front counties by an ichneumon, perhaps identical with *Pteromalus puparum*. The Cecropia moth has been rather numerous once or twice, but as it is preyed upon by at least four species of parasites, it can never become very destructive.

THE PEA WEEVIL—TWO BROODS.

Among the Coleoptera, the potato beetle, the turnip beetle, the pea weevil, and the plum curculio, have all done much injury. The pea weevil is rapidly moving northwards and westwards. In the vicinity of Toronto, in favourable seasons, there are two broods. From close personal observation, I am quite sure of this. I have been assured by careful observers that there are two broods in the townships south of London, so that the expedient of early or late sowing is of little avail, So rapidly is this insect increasing in the county of York that unless some remedy is applied, farmers will have to give up the cultivation of peas.

THE HYMENOPTERA.

Among the Hymenoptera, the currant saw-fly, the pear tree slug, and the raspberry slug, have all been more or less common and done much injury. Among the injurious Diptera, the wheat midge, the Hessian fly, the cabbage root and radish flies, occupy as conspicuous place. To this group also belong those insects which are injurious to domestic animals; mosquitoes, horse-flies, bot-flies, and many other species.

THE RED-LEGGED GRASSHOPPER.

The red-legged grasshopper has on several occasions done much injury to pastures meadows, and turnip crops. Oats also have been injured by them to some extent.

Q. Are there not two or three species of grasshopper that occasionally visit us? A. All the species found in Ontario are indigenous, none of them are migratory; the western migratory species does not reach us.

APPEARANCE AND SUDDEN DISAPPEARANCE.

Q. How do you account for whole districts being ravaged, and the grasshoppers suddenly vanishing? A. In Ontario the occurrence of two or three consecutive seasons favourable to their development, with the absence or rarity of their parasites would account for their rapid increase. One unfavourable season or the natural increase of their enemies would account for their disappearance.

THE GRASSHOPPER PARASITE.

The best known parasite which preys on the grasshopper is a *Tachina;* it has a wide geographical range, being from the State of Missouri to Manitoba.

THE GRASSHOPPERS IN MUSKOKA.

Q. Do you remember that about seven years ago grasshoppers were very numerous in Muskoka, and that they did much mischief? A. That was the red-legged grasshoppers Sections where there is much rotting wood or where there is much dry waste pasture land are most likely to be infested with them.

OTHER PARTS OF ONTARIO.

Q. Has this grasshopper ever done much injury in the better cultivated parts of Ontario? A. Much injury was done in the counties of York and Ontario about twenty-five years ago, and since then, on several occasions, the injury done has been quite noticeable.

[*Mr. Brodie.*]

THE REMEDY SUGGESTED.

Q. What remedy would you suggest? A. The introduction and acclimatization of foreign parasites and protection and assistance to native species.

Q. Is there a parasite which destroys the turnip beetle in Ontario? A. I do not know of one.

THE GRAIN APHIS AND OTHER PESTS.

Among the Hemiptera, the grain-aphis, the cabbage-aphis, the apple-aphis, the oyster-shell bark louse, have all done a great deal of injury. In 1863 the oat crop in New York was injured by the grain-aphis to that extent, that the average weight of oats this season was only fifteen pounds per bushel, and the yield per acre very small.

ANNUAL LOSS IN ONTARIO.

The annual loss in Ontario, from injurious insects, has been estimated to be over five millions of dollars; it is therefore most desirable that means should be applied to diminish this serious and unnecessary waste.

A SCHEME FOR PROTECTION.

Q. What general plans would you suggest? A. (1) Legislation to prevent the cultivation of affected crops over affected areas for one or more years. (2) Encouraging original researches into the habits and life history of native parasites through scientific societies or otherwise. (3) Artificial protection and assistance to the increase of native parasites. (4) Importation and acclimatization of foreign parasites that are likely to be useful, wherever found. (5) Protection to insectivorous animals that are nocturnal feeders. (6) Killing injurious insects in the imago form only. (7) Collecting the larvæ of injurious insects and placing them in suitable receptacles so that the parasites may mature and escape.

DIFFICULTIES NOT INSUPERABLE.

Q. Are there not practical difficulties in the way of introducing foreign insects? A. In some cases perhaps so, but English insects have been taken to Australia, American to Europe, European to America; bees have lately been brought from Jerusalem to Ontario; in fact it has been proven that insects may be brought from distant countries with a large measure of success.

ENCOURAGEMENT OF PARASITES MOST IMPORTANT.

Q. You would consider the encouragement of parasitic or beneficial insects, as a paramount consideration in combating injurious species? A. Yes; that is what I would especially urge as the important consideration; it is clearly in harmony with the order of nature; certainly the plans heretofore recommended and often extensively practised have seen failures more or less; in fact there are good grounds for the farmer's want of confidence in scientific men.

THE NATURAL HISTORY SOCIETY OF TORONTO.

Q. I believe you are connected with a scientific society at Toronto which makes a specialty of collecting original information about injurious and beneficial insects in Ontario. A. The Natural History Society of Toronto; a good deal of information has been collected and several of the members devote themselves mainly to this interesting and important pursuit.

WILLIAM BRODIE.

[*Mr. Brodie.*]

REV. C. J. S. BETHUNE'S EVIDENCE.

INSECTS INJURIOUS TO AGRICULTURE.

TUESDAY, *Oct. 5th, 1880.*

The Commission met again at 9.30 a.m. *Present*—Messrs. DYMOND AND SAUNDERS.

Rev. C. J. S. BETHUNE, M. A., of Port Hope, gave evidence as to insects injurious to agriculture.

THE ENTOMOLOGICAL SOCIETY.

He said:—I have for some years past paid special attention to insects injurious to agriculture. About the year 1862, or a little earlier, Mr. Saunders and I originated the Entomological Society of Ontario, of which I was at first Secretary, afterwards President for five years, and subsequently a member of the Council. At the present time I am Vice-President of the Society. I was also Editor of the *Canadian Entomologist* for some years, and Editor of the Entomological Department of the *Canada Farmer* for nine years—until about 1871. In this way I have had abundant opportunity of familiarizing myself with insect life in its various forms, and especially with insects injurious to agriculture.

THE WHEAT MIDGE—(*Cecidomyia Tritici*).

I have paid particular attention to the insects injurious to the wheat crop. The wheat midge, or *Cecidomyia tritici*, like a very large number of our most destructive insects, has come from Europe to America. It was first observed, as far as we have any records, in the State of Vermont about the year 1820. Some few years afterwards it was widely spread over the eastern and central States. In 1854 it was excessively injurious in the State of New York, so much so that it was estimated that, in this one year, the loss caused by this insect amounted to nine millions of dollars.

APPEARANCE IN CANADA—ENORMOUS LOSS.

In 1856 it appeared in Canada, and the loss to Canadian agriculturists in that year was roughly estimated at about $2,500,000. Next year, in 1857, in the Province of Ontario alone, it was calculated that the midge destroyed 8,000,000 bushels of wheat. It continued, from that time up to 1868, to be very destructive throughout this Province and the neighbouring States. Since 1869, it has happily become almost unknown to our farmers, and of late years I have not heard of a single instance in which injury has been done by it, though it is probable that specimens are to be seen here and there, but not in sufficient numbers to attract the attention of the farmers.

DESCRIPTION OF THE MIDGE.

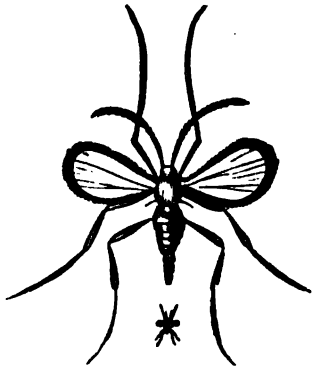


Fig. 1.

Fig. 2.

Fig. 3.

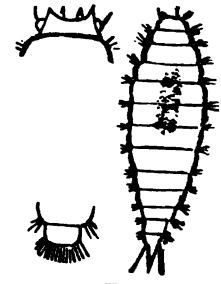


Fig. 4.

Not more than one-tenth of an inch long. *Fig. 1* represents a highly magnified specimen with the wings expanded; the outline below shows its natural size. *Fig. 2*, the same, with closed wings. *Fig. 3*, the eggs. *Fig. 4*, the outline of the larvæ, highly magnified.

[*Mr. Bethune.*]

The midge is a very minute fly—so minute that a casual observer would probably never notice it. It is very much like the Hessian fly in its perfect state, the chief difference between the two insects being that the body of the midge is yellow, while that of the Hessian fly is black; otherwise—in the structure of the wings and the antennæ—they very closely resemble each other. They both belong to the same genus of insects, but though similar in appearance they are very different in their habits.

HABITS OF THE MIDGE.

The midge frequents the ripening ears of the grain; the eggs are laid in the young and tender blossoms of the wheat, and as soon as the larvæ are hatched from the eggs they begin to feed upon the juices of the grain-kernel and continue extracting the juices of the grain, causing it to shrivel up and become utterly worthless. When the period of the ripening of the grain arrives, the larva descends to the earth, and remains there throughout the winter. In the following spring it transforms into the pupa state, and in the month of June—earlier or later, according to the season—the perfect insect or fly makes it appearance, just about the time when the young crop of grain is beginning to assume the flower state. Its presence at this time of the year is made known to entomologists and others by large numbers flying in at the windows at night, covering the lamps, the papers on one's table, etc.; it is in that way that I have chiefly noticed the perfect insect.

CAUSE OF ITS DISAPPEARANCE.

To Mr. Dymond.—I am inclined to ascribe the diminution in numbers, in fact, the almost total disappearance, of the insect, in part to the work of parasites, although we have not discovered any specimens, as they would in all probability be even more minute than the insect itself.

FRIENDLY PARASITES.

In England, it is well known that there are parasites which attack the wheat midge and much surprise was expressed, at the time its ravages were so great in this country, that we did not experience the benefit of parasites in the same way that the farmers of England and the continent had.

PROPOSAL TO IMPORT PARASITES.

I corresponded at the time with Mr. Francis Walker, of the British Museum, a very well known entomologist, on this subject. My idea was that it would be worth while, if possible, to import these parasites from England, breed them here, and so set going one of the natural and most efficacious checks upon the ravages of this creature. Mr. Walker stated that there were, at least, two well-known parasites—chalcis flies—that preyed upon the wheat midge in England, but he said it would require the attention of a thoroughly scientific entomologist for several months, together with great care and labour, to obtain these creatures. The danger of making a mistake would be very great, as also would be the difficulty of getting them out at a proper time, but he thought it could be done. My own impression was the same, and I wrote upon the subject at the time in the *Canada Farmer*, and was about to bring the matter before the notice of the Legislature, but just then the midge began to cease its attacks upon the wheat, and it did not seem to be a matter of any further consequence.

CHIEFLY FALL WHEAT ATTACKED.

It was chiefly fall wheat that was attacked, and in consequence of the serious nature of the ravages of this pest, the culture of fall wheat was almost abandoned. I may mention how it came that fall wheat principally was attacked. The perfect insect appears in June, and wants immediately to lay its eggs. The fall wheat is then in a condition suitable for

that purpose, being in blossom, but the spring wheat is not sufficiently far advanced, and consequently the fall wheat is the natural food of the insect. If it were confined to spring wheat it would probably be exterminated, as the spring-sown grain is not open to its attacks to the same extent at all.

MIDGE-PROOF VARIETIES OF WHEAT.

The other mode in which the ravages of the midge have been checked was the introduction of what were called "midge-proof" varieties of wheat. Some of these varieties were of a much harder texture as regards the envelope of the kernel, resisting the insect in that way, and some matured much earlier, and some much later than usual. The conbined results were that the wheat midge is a thing almost unknown to our farmers now I have no doubt, however, that it is still in existence, but not to any prejudicial extenta.

APPEARANCE OF MIDGE-ATTACKED WHEAT.

In wheat attacked by the midge, the ear of the grain is upright and shrivelled, with no appearance of weight at all. If the attack is severe, there perhaps will not be a single perfect grain left in the ear ; if not so severe, a few grains only may be injured. If you rub out an ear of midge-affected wheat in your hand, instead of getting a number of plump round kernels, you will only get some very much shrivelled ones, and amongst them a number of tiny, yellow objects. These, on examination, will prove to be footless grubs, the maggot of the midge.

PRACTICAL REMEDIES.

One practical remedy that was recommended at the time was to burn all the screenings of affected wheat—all the refuse of the fanning-mill, the sweepings of the barn floor, or any place where the grain had been stacked, and where the insects would naturally be shaken out. Another remedy was that in the fall the infested wheat fields should be very deeply ploughed, with the object of burying any insects that might remain as far below the surface as possible, the advantage resulting from this mode being that in the following year, they would not be influenced by the warmth so early as otherwise, their development would be retarded, and in all probability their appearance would be too late to be followed by any great injury. By these several methods they would, in fact, be starved out.

THE MIDGE-PROOF WHEATS.

The plan of using only the so-called "midge-proof" varieties of wheat was the most effectual. A number of varieties were introduced, but, when any one was sown to a large extent, it would, as in the case of the potato, begin to deteriorate. Nothing was done to import the parasitical insects, of which I spoke, from England, as it did not seem to be worth while, under the circumstances.

EARLY AND LATE SOWING SUGGESTED.

Besides the remedies I have mentioned, another was proposed, viz., that spring wheat should be sown as late, and fall wheat as early, as possible, the object being that the former should be matured too late, and the latter too soon, for the attack of the midge in the month of June.

MOISTURE FAVOURABLE TO THE MIDGE.

A peculiarity about this insect is its love for moisture. I have found the larvæ to remain perfectly dormant, apparently lifeless, for a long time—some few weeks—but the moment moisture was applied they would exhibit signs of animation. It was accordingly found that wheat grown on damp ground was much more seriously affected than that grown on higher and drier lands. This would be a decided argument in favour of underdraining.

[*Mr. Bethune.*]

WHY DID WE NOT GET THE PARASITE WITH THE MIDGE?

There is another matter in connection with the parasites that I wish to mention. The question is often asked, How is it that we did not get the parasite with the original insect, as the latter was a European importation? The answer to that is, that the parasite in England attacks the larva or grub, as it is proceeding from the ear down to the earth to take up its winter quarters, and not while it is in the ear. The way in which the midge was introduced into this country, was, of course, by being brought in imported wheat, some grains or the chaff of which contained the larvæ of the insect. The parasites, not attacking it in that stage, did not accompany it to this country.

THE HESSIAN FLY—*(Cecidomyia destructor).*

To Mr. Saunders.—The technical name of the Hessian fly is *Cecidomyia destructor*, and, until the present year, this insect was also regarded as a European importation. It received its name because it was popularly supposed to have come to America in grain brought over by the Hessian troops employed by the British Government, during the time of the American Revolutionary War. These troops landed on Staten Island in 1776, and, in the immediate neighbourhood the fly was first observed, spreading thence over the United States and Canada.

THE HESSIAN FLY INDIGENOUS.

At the meeting, in August, of the American Scientific Association, however, Dr. Hagen, director of the Museum of Comparative Zoology at Cambridge, Mass., read a paper showing that it was quite impossible for the fly to have been brought out in this way. He came to the conclusion that the insect was indigenous to North America, and that instead of its coming here from Europe it has been introduced into Europe from America. He also showed that it had never been known in Central Europe, where the Hessian troops came from, until a number of years after it had been very destructive in America. (Dr. Hagen's paper is published in the *Canadian Entomologist* for October, 1880.)

FIRST RECOGNIZED IN THE STATES.

It appeared first in the States in 1776, and in a short time spread over New York, Connecticut, New Jersey, and the neighbouring States.

FIRST APPEARANCE IN CANADA.

It was first noticed in Quebec in 1816, and in Ontario in 1846. Since that time up to the present day it has been a very familiar insect. Its ravages of late have not been very serious, though it is heard of every year in some parts of the Province. Last year it slightly affected the crops in Northumberland County, but I am not aware that it occurred elsewhere. I have no doubt, however, that if we could make an estimate of the loss caused by this insect, it would be found to be still not inconsiderable.

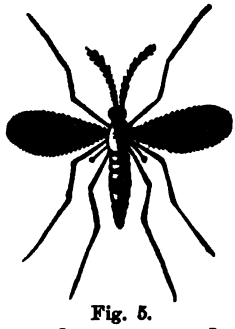


Fig. 5.
[*Mr. Bethune.*]

APPEARANCE OF THE HESSIAN FLY—HABITS.

In appearance it is very similar to the midge *(see Fig. 5)* but its mode of attack is entirely different. It appears first in the fall at the root of the fall wheat plant; its eggs are laid, and the larvæ hatched out below the surface of the earth on the root, and there they remain all winter, the brood appearing in the spring. There is a second brood in the spring which attacks the stalk, where the insect is most generally noticed. Farmers hardly ever observe the insect at the root, but every one who has observed it has seen it on the stalk.

MODE OF ATTACK.

It attacks the stalk just above the first or second joint from the root, where it is enveloped by the leaves. The larvæ vary in colour at different periods of their existence, being very pale at first, but afterwards of a deep chestnut colour. Their first attack is made when the stalk is very tender and green, and they puncture it to extract the sap, the result being to cause a small depression where the larvæ remain. There may be five or six encircling a single stalk at one time, and the result of their combined efforts is to weaken and finally to break it, causing it to fall down, thus ruining the grain.

A TRANSFORMATION.

After the larva has fed for a considerable time upon the stalk, it assumes what is called the "flax-seed" state, resembling in colour, size, and general appearance, a germ of the ordinary flax seed. In that state it continues for a considerable period, and it is carried from the field to the granary while in this condition. It is a very much discussed point as to what this "flax-seed" stage exactly is. It is looked upon as the pupa stage, but how it is produced—being so different from the form common among insects—has not been determined upon by entomologists, some thinking that the "flax-seed" covering is the pupa stage, and others that it is an exudation from the body. The Hessian fly attacks the stalk solely, never the ear.

PARASITES TO THE RESCUE.

There are, happily, a number of parasites which prey upon it; these being minute chalcis flies, ichneumons of various kinds, and probably some of what are more properly termed "bugs."

SPRING WHEAT LESS AFFECTED.

Spring wheat is never so seriously affected by it as fall wheat, because the former, coming to maturity the same season in which it is sown, affords no hiding place for the larva, wherein to hybernate during the winter.

INSECT YEARS.

To Mr. Dymond.—It is impossible to tell when these checks might be removed and the insect again prove very destructive. Any one who has paid attention to the subject has observed that there are what may be termed "insect years." For three or four consecutive years a certain insect is excessively abundant, then it almost entirely disapeared to again become destructive in a short time. It would seem that, under favourable circumstances, the parasites gain headway and reduce the numbers of the ravager; after a time not having sufficient food, they cease; the check is removed, and the destructive part again comes to the front. One season too, may be favourable to insect life, and the next season just the reverse.

EFFECTS OF SEASON.

Taking insects generally, a warm, dry season is the most favourable, and when two or three such seasons occur consecutively, the result is an immense development of insect life if after that we should experience a cold, wet season or two, the numbers of the insects are reduced almost to a minimum.

THE PARASITES OUR BEST FRIEND.

We owe, however, infinitely more to the work of parasitical insects than to any other cause whatever, for the keeping down of insect pests. That, at any rate, is my opinion, and it is one which I have formed on actual observation and long experience

[*Mr. Bethune.*]

ARTIFICIAL REMEDIES.

The artificial remedies I would recommend would be the abandonment of fall wheat *pro tem.*, or to sow as late as practicable in the autumn, in order that the larvæ may not find the plant sufficiently advanced for their attacks at the roots before winter sets in. An additional remedy—if it may be so called—is to practise thorough cultivation, in order to make the plant as strong and healthy as possible, that it may the better withstand the attacks of the fly. I have not observed that the Hessian fly is attracted by moisture in the same manner as the midge. Its *habitat* in the summer is a very dry one, being under the close envelope of leaves which protect the stalk above the first or second joint.

THE LARVA OF THE MIDGE AND HESSIAN FLY.

The larva of the midge is a footless grub, which moves only by contracting and expanding the segments of its body. It cannot, consequently, crawl down the stock of the wheat, and has therefore to wait for a shower of rain, or excessive moistness of some kind, of which it takes advantage to slide down to the ground, and so enter the earth. The Hessian fly, on the other hand, does not require any aid of that kind.

THE CHINCH BUG—(*Micropus Leucopterus*).

To Mr. Saunders.—The technical name of the chinch-bug is *Micropus leucopterus.* This insect has never been known to be very destructive in Canada, but in some parts of the United States it is looked upon as the very worst foe of the farmer, as far as regards the cultivation of wheat. It is not formidable in New England or the middle States; but in the Western States, such as Iowa and Illinois, it is very much dreaded. I regard it as an enemy with whose habits we should in this country be acquainted, as our proximity to the Western States renders us at any time liable to an invasion from it.

A DANGER TO BE GUARDED AGAINST.

Except a slight difference in the climate I know of no reason why it should not thrive in this country. This insect requires heat and drought, to long continued spells of which the Western States are much more liable than Ontario; but I think there is great danger of its importation into Manitoba from the neighbouring State of Minnesota. It has been seen in Canada, so that it may be termed a Canadian insect. In 1866, Mr. Johnston Pettit, of Grimsby, sent me some specimens that he had obtained, late in the autumn, under the bark of trees. Mr. Pettit is a well-known collector of insects, and in fact one of the most painstaking entomologists we have in this country. I wrote an account of the insect at the time, and cautioned farmers against it, in the columns of the *Canada Farmer*

VARIOUS KINDS OF GRAIN ATTACKED.

It does not confine itself to wheat, but attacks grain of various kinds. It hybernates in the autumn and winter in the bark of trees, which affords it a protection against cold and storms.

HYBERNATION—A PROLIFIC PEST.

It hybernates in its perfect state, while the Hessian fly, as we have seen, passes the winter in the larval state. In the Western States, where it is so abundant, there are a great many broods during the year.

[*Mr. Bethune.*]

WATER DESTRUCTIVE TO IT.

One of the remedies for it is the application of water. A heavy thunder storm, during the season of its ravages, is worth millions to the farmers of the Western States. It is so excessively numerous there, at times, that every living article of vegetation is completely covered with it. It is also very offensive, belonging to the "bug" family properly so called.

METHOD OF ATTACK.

Its method of attack is to cluster about the heads of grain, and extract the juice by means of its proboscis or snout. It makes its appearance on the grain in all stages

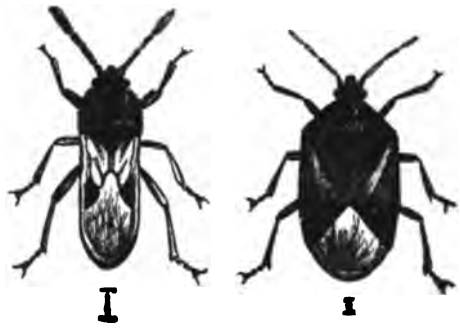


Fig. 6.

Shows, on the left hand a specimen of the true chinch bug, on the right an ordinary bug, magnified.

(See fig. 6.) One brood after another keeps constantly appearing, from early in the spring till late in the autumn. It attacks barley, oats, rye, and other crops as well as wheat.

NEVER QUIESCENT—ALWAYS HUNGRY.

The order to which the chinch bug belongs, viz., the *Hemiptera*, do not undergoe complete transformation, and have no quiescent state, such as those insects which assume the butterfly form, during which they remain dormant and take no food whatever, but from the time they are hatched to the time of their death are incessant feeders, and consequently are more destructive individually than the other orders. In the case of this insect, as with many other bugs, we may find it at the same time in all stages of growth, from the minute undeveloped creature to the perfect winged insect, and all hard at work sucking out the juices of the plant they attack. From not having had an opportunity of personally studying the habits of the chinch bug, I cannot tell where its eggs are laid, and am not so familiar with it as with our own insects.

ENEMIES OF THE CHINCH BUG.

There are a great number of insects who prey upon this creature, chiefly the large carnivorous ones, such as the lady-birds, the lace-winged flies, and the *syrphus* flies. The next insect to which I propose to refer is the grain *aphis;* the same friendly insects are beneficial in both cases.

THE GRAIN APHIS *(Aphis avenæ).*

The grain aphis is of the same family, *Hemiptera*, and is a bug on a very minute scale; it is technically called *Aphis avenæ*. The family of *Aphidæ*, or plant lice, is known to every one who cultivates flowers or plants of any kind, and their life-history is a somewhat curious one.

[*Mr. Bethune.*]

THE APHIDÆ OR PLANT LICE.

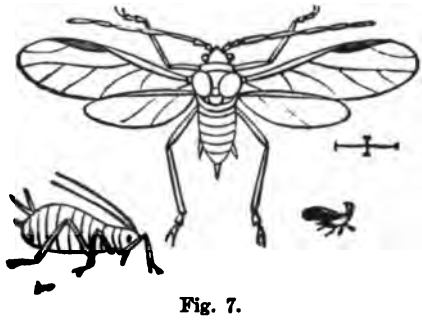


Fig. 7.

Fig. 8.

The above figures will serve to illustrate the insects belonging to this family. *Fig. 7* represents a highly magnified winged male and wingless female. *Fig. 8*, the wingless female very much enlarged.

In the early part of the summer, the *aphidæ* may be found in great abundance, and they continue very numerous until towards the close of the season. It has been found, by close observation, that the females require only to be fertilized by the male once during a very large number of generations, that is to say, one impregnation by the male will last through the descendants of the original female for perhaps twenty-five or fifty generations. The males, consequently, are not required very frequently, and they make their appearance usually towards the close of the season. The males possess wings.

EXCESSIVE FERTILITY.

The excessive fertility of this insect may be imagined, when I mention that each female produces about four young ones a day, and these young ones are all females and able to produce offspring in like proportion when three days old, so that it has been calculated that in twenty days the progeny of one female—provided there were no disease or accident in the family—would amount to 2,000,000 individuals. If it were not for the various checks imposed upon them, in a very short space of time, the whole habitable portion of the earth would be covered by these insects, and man would be quite driven off. There is probably no kind of vegetation that is exempt from their attacks.

WINTER HABITS.

Some few of these insects pass the winter in hiding places out of doors. The impregnated females lay eggs in the autumn that survive the winter, and these hatch out in the spring. It is my opinion that these eggs all then hatch females, and the series of females continues until about the close of the season, when the males make their appearance.

ALWAYS FEEDING.

The insect's mode of life is the same from the time it is born until it dies,—it has, as a rule, its proboscis inserted into the plant on which it lives, pumping out its juices; in fact, it needs a constant supply of food to live, and if it were detached it would die. This does not, however, apply to the winged specimens; their object is to establish new colonies, and to perpetuate their kind.

ORIGIN OF "HONEY-DEW."

In feeding, this insect takes in such a large supply of liquid that it cannot assimilate [*Mr. Bethune.*]

it all, and is consequently obliged to part with some of it. This, dropping upon the surrounding leaves of the plant, is a sweet, sticky substance, called "honey-dew," and ants and other sweet-loving insects are excessively fond of it.

THE ANTS' MILK COWS.

Ants are so intelligent that they make a regular business of looking after the *aphidæ*, and getting them to part with their "honey-dew," just as we obtain milk from a cow. They may be often seen pressing the body of the aphis at the hinder part of the abdomen thus forcing the latter to part with little drops of "honey-dew," of which they immediately make use. Indeed, *aphidæ* used for this purpose have been known to be enclosed in a regular pasture, over which the ants kept watch to ward off intruders.

ITS ATTACKS ON GRAIN NOT USUALLY SERIOUS.

As a rule, the attacks of the grain aphis are not serious, though in the year 1861 its depredations were very considerable. I have not heard of its being very destructive to wheat since.

INSECT ENEMIES OF THE APHIS—OTHER CASUALTIES.

It is preyed upon by a great number of insects, chiefly by those I mentioned in connection with the chinch-bug,

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

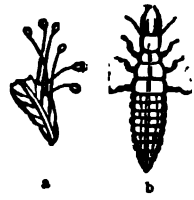


Fig. 15.

Fig. 16.

Fig. 17.

The most common and useful are the different species of lady-birds, four of which are shown by Figures 9, 10, 11, and 12. *Fig. 9* is the 13-spotted Lady-bird *(Hippodamia 13-punctata)*. *Fig. 10*, the 9 spotted Lady-bird *(Coccinella 9-notata)*. *Fig. 11*, the plain Lady-bird *(Coccinella munda)*. *Fig. 12*, the spotted Lady-bird *(Hippodamia maculata)*. *Fig. 13*, shows the larva of one of our common lady-birds. The lace-winged flies *(Chrysopa)* are also enemies of the *aphidæ*, both in their perfect states *(Fig. 14)*, and in their larva state *(Fig. 15)*. The latter figure also shows the curious stalked eggs of this insect. The list also includes the Syrphus flies, shown in the larva state *(Fig. 16)*, and the perfect fly *(Fig. 17)*.

They are especially liable to reduction in numbers by changes in the weather; heavy thunderstorms wash off and kill them, as they have no means of regaining their position. I have known house plants infested with the aphis to very soon get rid of it when placed out of doors. The hot, dry atmosphere of the room seemed more favourable to the insect than the lower temperature outside, and there it was not subject to checks which acted upon it in the open air.

[*Mr. Bethune.*]

THE JOINT WORM—(*Isosoma hordei*).

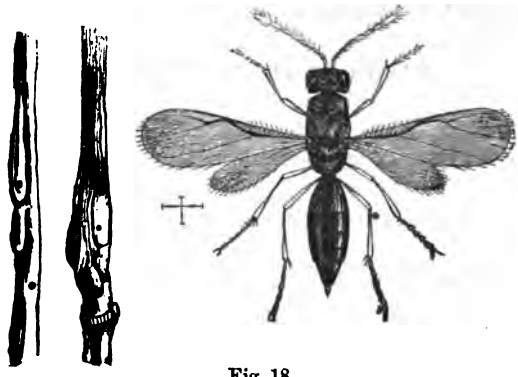


Fig. 18.

The joint worm (*Isosoma hordei*) is specially injurious to barley and rye, occasionally attacking oats. It is not very common in America anywhere, but there are bad years for this insect as for others. In 1866 and 1867 it was somewhat prevalent in Ontario.

MODE OF ATTACK.

Its eggs are laid in the month of June, and like those of the Hessian fly, are deposited just above the first or second joint of the grain; the Hessian fly, indeed, having sometimes been mistaken for it. The effect of its work is to raise a gall or excrescence on the stalk of the grain, close to the joint, somewhat resembling a joint, hence its name. The insect lives inside this swelling, where its larvæ work, while the Hessian fly lives in the depression of the outer surface. It attacks the stalk only, not the ear.

ARTIFICIAL MODES OF RESISTANCE.

The best artificial mode of combatting this insect is either to burn the stubble of the infested grain, cutting high, so as to leave the first and second joints standing, or to cut very close and burn the straw afterwards. These, however, are dangerous remedies, on account of the risk incurred by the use of fire.

THE ANGOUMOIS MOTH—(*Butalis cerealella.*)

This insect is not found to any large extent in this country. It is a caterpillar or moth, belonging to the order *Lepidoptera*, and like many other insects, it may be numerous at times in certain localities, but for a long period of years it has not been of any great importance at all.

THE ARMY WORM—(*Lucania unipuncta*).

The army worm frequently attacks our crops. There are several insects known by

Fig. 19.

Fig. 20.

Of which *Fig. 19* shews the caterpillar, and *Fig. 20* the moth.

[*Mr. Bethune.*]

this name in popular phraseology, but the insect which the entomologists regard as the army worm is a very common caterpillar, turning into a moth, and which is found all over this country and in Europe, but especially in the United States. Long Island is one of its most famous habitats.

HABITS OF THE ARMY WORM.

This insect, so far as its habits are thoroughly known, feeds chiefly upon wild grasses of all kinds, and upon the grass of moist meadows and marshes, at times being excessively abundant.

MIGRATIONS OF THE ARMY WORM.

So abundant does it sometimes become in its own locality that, like the chinch-bug, and the locust of the west, and many other insects, it sets out to find fresh supplies. In order to do this, the insects assemble in very large numbers, and they all seem to go with one accord in a certain direction, as if they were a regularly marshalled army, hence the name "army worm." Of course the stories about their being told off in battalions, etc., are purely mythical. Generally speaking, they do not turn aside for any obstacle; if they come to a fence or a barn, they try to go over it instead of around it. They will stream across roads, and the railway tracks in Long Island, and lately in New Brunswick, have been covered to such an extent as to prevent the movement of the trains, the driving wheels of the locomotive being so greased that they could not bite on the rail, and sand or earth had to be thrown on the rails to enable them to do so.

METHOD OF MEETING THE ARMY WORM.

We in Ontario have never been visited in such numbers, but we have had them to a certain extent, and they are very destructive. When they appear in numbers the best method of meeting them would be to plough a deep furrow, or dig a trench, in the front of their line of march, with a steep side in the direction in which they are going, and when they are trying to get out of it, to throw straw or shavings or something of the kind and set fire to it, or otherwise to bury them with earth. It is an insect to which we are liable at any time, and any sort of vegetation, whether grain crops or anything else, is food for it. It is a very common insect, and I suppose all our gardens have a few specimens at all times, but it does not propagate very rapidly in our climate, though if the checks upon it were removed, it would increase enormously in numbers.

PARASITES OF THE ARMY WORMS.

The parasites which prey upon it are very numerous, ichneumons of many kinds, beetles of various kinds, and it is probably eaten also by birds to a limited extent. Poultry, especially turkeys, will eat it.

THE WIRE WORM—*(Agriotes mancus)*.

The wire worm *(Agriotes mancus)* is sometimes troublesome to wheat. This insect lives altogether out of sight, under ground, and hence it is not much observed by the farmer. It is a long slender grub, with six legs under the anterior portion of the body, usually of an orange yellow or tawny colour, and is very hard, unlike our caterpillars which are soft to the touch, consequently receiving its name, the "wire-worm." It feeds under ground upon the roots of vegetation, and is looked upon in England as one of the very worst foes of wheat. In Ontario, we have not been able to estimate its ravages as resulting in any great loss, though this may be because they are carried on out of sight. It is frequently observed in ploughing.

[*Mr. Bethune.*]

THE SPRING-BACK BEETLE.

Unlike the insects about which I have been speaking, it turns into a beetle, or hard-shelled insect, commonly known as the "spring-back" beetle. The perfect creature is very familiar; it flies into the house at night, attracted by the light, and may be found creeping about sap exuding from trees, ripe fruit, or anything sweet. There are a large number of species which resemble each other closely. The peculiarity of the beetle is that if by any accident it is laid on its back, it is unable to turn itself over; it therefore presses down the head and the tip of the abdomen, gives a jerk, springs into the air, and the chances are that it lands on its feet.

A GOOD REMEDY.

A good remedy for this creature, where it is abundant, would be to have some children follow the plough to gather them up and destroy them, also to allow turkeys and ducks to range the ploughed fields.

DADDY LONG-LEGS—*(Tipula).*

There is one more insect affecting grain which I may mention, the *tipula larva* which is the progeny of a fly with excessively long legs, popularly called "daddy long-legs." Its larva is a grayish, dirty-coloured caterpillar that feeds upon grain, and vegetation of a similar kind. It has the faculty of surviving intense cold. Some years ago specimens were sent me that were gathered at the close of the winter in a field near Cobourg; they seemed to be perfectly hard frozen, and apparently as brittle as little sticks, but on the application of warmth, they became quite lively and prepared to feed.

DANGEROUS TO GRASSES.

This insect is more injurious to timothy and our ordinary cultivated grasses than to grain. In its caterpillar state it attacks the roots of the plant, and I have seen meadows and neglected lawns very seriously injured by its ravages.

IMPORTANCE OF FOREWARNINGS.

To Mr. Dymond.—It would be of very great aid towards the extirpation of these pests if notice could be given when their attacks are observed in any locality, whether by those who gather the statistics with regard to crops, or in some similar way. I do not know of any such machinery at present in operation. Sufficient notice is required in order that assistance may be given. Under present circumstances we, who pay attention to these things, merely hear what goes on in our immediate neighbourhood, or gather from paragraphs in the newspapers what occurs outside, and of course information gained in this way is comparatively small in amount.

THE SIGNAL SERVICE BUREAU AND THE LOCUSTS.

The United States Commission on the Rocky Mountain locust were immensely aided by the Signal Service Bureau, scattered as the members of it were, over a very large area of territory. They had proper instructions given them, and whenever the locust appeared in any locality, they immediately telegraphed the fact to headquarters. The Commission, in that way, were enabled to keep their eye on an enormous region of the country at one time.

AGRICULTURAL SOCIETIES TO REPORT.

If the secretaries or other officials of our agricultural societies would make known, at some headquarters, whenever an attack of this kind occurred in their various localities, it would be of great help towards checking it in time.

[*Mr. Bethune.*]

A BUREAU OF ENTOMOLOGY WANTED.

This, however, would necessitate a Central Office of Entomology, and I would suggest the advisability of the Government appointing a person to take that department in charge, just as is done in many of the United States. They have had such an office for many years in the State of New York, and we have found the work of Dr. Asa Fitch, the first incumbent, of the utmost value to ourselves.

MILLIONS SAVED IN THE STATES.

It is known as a fact that he saved not only the State to which his work was confined, but the whole Union, millions upon millions of dollars, by the information which he had been able to obtain and disseminate. The States of Illinois, Missouri, New Jersey and Massachussetts have had State Entomologists for several years, and other States have Entomologists in connection with their agricultural colleges who give their attention to the subject. The advantages of the office of Provincial Entomologist would be that a man could devote his whole time to its duties, and whenever he found that a particular locality was threatened with the attack of any insect he would at once go there and investigate the matter on the spot, which a person engaged in any other occupation could not do. In this way Prof. Riley, as State Entomologist for Missouri, was enabled to do a great deal of invaluable work, and I think it would be quite worth while for this Province to have an official of this kind. I have no doubt, if sufficient renumeration were offered, that a suitable person—he would of course have to be a thoroughly skilled Entomologist—could be obtained without much difficulty. Even if $10,000 a year were spent in maintaining an office of this kind, it would be the means of saving hundreds of thousands of dollars to the community in general.

THE COLORADO BEETLE—*Doryphora decemlineata.*

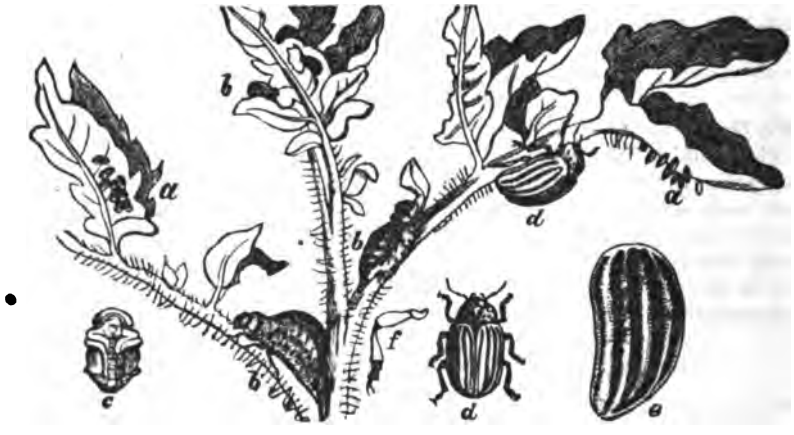


Fig. 21.
Shows the Colorado Beetle in its various stages of development.

To Mr. Saunders.—The principal potato insect is, of course, the Colorado potato beetle, otherwise *Doryphora decemlineata*, or the ten-lined spearman, so called from its peculiar markings. (*See fig.* 21.) Nearly all our destructive insects have been introduced from Europe, but this is an exception to the rule. It is an indigenous American insect, which apparently existed before civilization in some of the remote valleys or canons of the Rocky Mountains, feeding upon some native members of the botanical family *Solanaceæ*, to which the potato belongs, and had been known to Entomologists for a long

time before its late extension. In course of time the cultivation of the potato spread westward until it reached the base of the Rocky Mountains, and the insect then found a plentiful supply of food close at hand. Feeding upon a wild species of potato, it had no difficulty in accustoming itself to the cultivated variety, and at once a very large increase in its numbers took place.

Migrations Eastward.

It kept moving eastward, still increasing in numbers, until it covered the whole of the States west of us. In 1871 I found it very abundant at Chicago, and on the shores of Lake Michigan; it was then unknown in Canada. I wrote some articles in the daily and weekly *Globe*, and *Canada Farmer*, calling attention to the insect, and warning the people of this country of the invasion which was about to take place, and proposing that some measures should be taken by the Legislature to ward it off, if such a thing were practicable. Nothing, however, was done, and the following year the insect made its appearance, crossing the river St. Clair.

A Fast Traveller.

We supposed that it would have gradually come eastward, but to our surprise, it took advantage of the railways and canals, and spread itself with great rapidity, even to the remote parts of the Province. Having once arrived in this country, there was no possible means of repelling the invasion, and the only plan was to keep it under as far as possible.

PARIS GREEN—THE BUG CHECKED.

As the result partly of the experiments of Professor Riley, and partly of those of Mr. Saunders and Mr. Reed, who were appointed a committee by the Department of Agriculture, Paris Green was found to be the most effective remedy. This information being communicated to the public by the Department of Agriculture and the newspapers, our farmers at once became informed of the best mode of attacking the insect, and ever since, it has been kept in fair check. At first the crop of potatoes was short and the price raised, but since the first two or three years it has not been looked upon as a very serious pest, simply because everybody is on the *qui-vive* against it. I am certain, however, that if the community were to relax their efforts, it would soon eat up all our potatoes. There is no doubt that it is now a permanent resident of the country, and that we shall never be entirely free from it.

FEEDING GROUNDS OF THE BUG.

It lives upon all the members of the solanaceous family; it will occasionally attack the tomato, it is very fond of the egg-plant, and the wild members of the family, such as the bitter-sweet, and the deadly nightshade.

CARE IN USING PARIS GREEN.

It is a disputed point whether Paris Green prejudicially affects the potato plant, but there is no evidence, so far as I know, that it does. It is a question whether, if used year after year on the same piece of ground, it would not affect the soil somewhat. I think our farmers are not sufficiently careful in handling it. It is excessively poisonous, and there are every year a number of cases of poisoning arising from its use, which ordinary care would be sufficient to guard against.

INSECT PARASITES.

There are a number of insect parasites which attack the Colorado beetle, but, of course, the application of Paris Green kills these as well as the beetles. If the potato were not grown to such an enormous extent, these parasites would keep the beetle down to the dimensions of an ordinary plague, without artificial remedies.

[*Mr. Bethune.*]

LONDON PURPLE.

London purple is another remedy which seems to be effective, but I do not know that it is of quite so much value as Paris Green.

DESTROYING THE EGGS.

It is a good plan to resort to handpicking and destroying the eggs early in the season and keeping the practice up throughout the summer, especially if any children are about. There is considerable danger in the use of Paris Green in market gardening, as it is liable to fall upon other vegetables.

THE WAY TO USE PARIS GREEN.

Where potatoes are grown by the acre, the best way to use the Paris Green is to apply it dry mixed with lime, ashes or earth, but wherever there is a danger of its being blown upon other vegetables, the better way is to mingle it with water and apply it with a whisk. It can be done just as rapidly in this as in any other way. The bug is now spread over all the northern part of this continent; it is as great a pest in Nova Scotia and the Maritime States as in Nebraska. Almost frantic efforts are being used to keep it out of Europe, and one or two specimens are all that have ever been known there. I do not think it will ever become very injurious in England, as the climate is so moist, the insect requiring more heat and dryness than they have there, but it will, in all probability, become as widely spread over Central Europe as it is here.

ENEMIES IN THE EGG STATE.

In the egg state the beetle is preyed upon by our old friends, the lace-winged flies, the lady-birds, the soldier-bug *(Reduvius raptatorius)*, Fig. 22, and, I think, some other bugs; a number of the carnivorous ground beetles also attack it. Figs. 23, 24, 25.

Fig. 22.

Fig. 23.

Fig. 24.

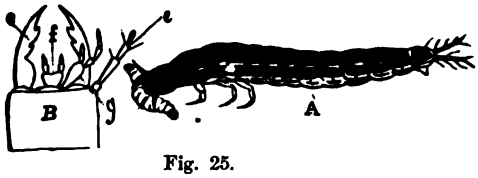


Fig. 25.

Fig. 22.—The soldier-bug *(Reduvius raptatorius)*. *Fig. 23.*—The glowing calosoma *(Calosoma calidum)*. *Fig. 24.*—The murky ground beetle *(Harpalus caliginosus)*. In *Fig. 25* is shown a larva of Harpalus, which gives a very good idea of the larvæ of these ground beetles, which may be often met with under stones and stumps in slightly moist places.

No doubt many millions of the beetles are destroyed annually by these insects.

[*Mr. Bethune.*]

THREE-LINED LEAF BEETLE—*Lema Trilineata.*

Another very common beetle destructive to the potato in this country is the three-lined leaf beetle (*Lema trilineata*).

Fig. 26.

Fig. 27.

Fig. 26 represents the larvæ of this insect; and *Fig. 27*, the beetle.

which has been known ever since the introduction of the potato. It sometimes occurs in sufficient numbers to do a good deal of damage, but its ravages have been so completely overshadowed by those of the Colorado beetle, that we hardly ever hear of, or notice it now.

PARIS GREEN A REMEDY.

In case of its assuming serious proportions, I should say that Paris green would be a good remedy. It feeds upon the leaves of the potato plant, in the same way as the Colorado beetle, both in the larval and perfect states. It was sometimes mistaken for the Colorado beetle, when the latter first made its appearance.

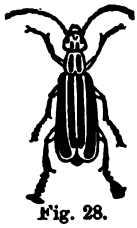


Fig. 28.

THE STRIPED BLISTER-BEETLE—*Epicauta vittata.*

The striped blister-beetle, or *Epicauta vittata*, also feeds upon the foliage of the potato plant, but it is never sufficiently numerous to be a serious pest. In case of an attack from this insect, Paris green would be a sufficient remedy.

THE POTATO OR TOMATO WORM.

There is a worm that feeds upon the leaves of the potato, though preferring those of the tomato, known as the potato or tomato worm.

It is some five inches in length, as thick as a man's finger, and has a very prominent tail at the posterior end of the body.

A THREATENING ATTITUDE—NOT REALLY DANGEROUS.

When disturbed, it raises its head in a very threatening manner, and altogether looks so ferocious, that it is popularly supposed to be very poisonous, which, however, is not the case, its bite being so feeble as not even to penetrate the tender skin of one's hand or arm. When connected with the *Canada Farmer*, I looked into a number of cases in which the bite or sting of the insect was alleged to have caused poisoning, and found every one of them utterly unfounded, and came to the conclusion that the stories had been caused either by the juices of the tomato plant getting into an open wound, or by the sting of a wasp sometimes found amongst these plants. This worm has been ascertained to be identical with the tobacco-worm, which is so great a pest in the Southern States.

[*Mr. Bethune.*]

THE SPHINX QUINQUEMACULATA.

It turns into a very handsome moth, known as *Sphinx quinquemaculata*, from the five orange spots on its body.

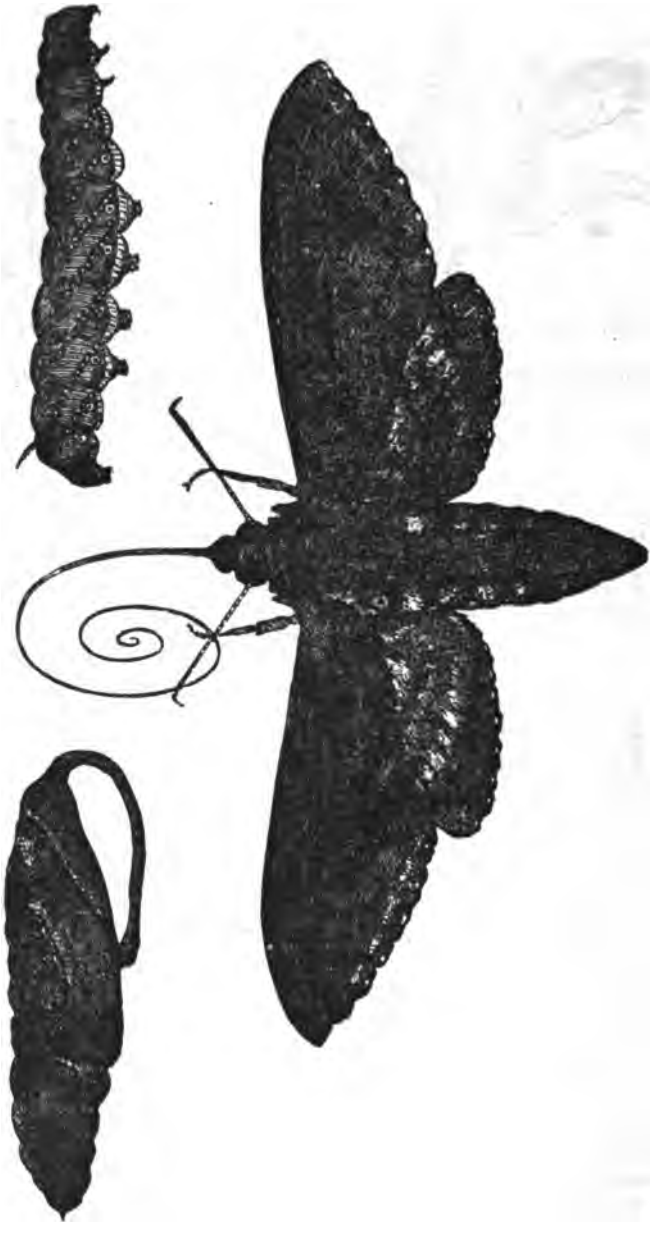


Fig. 29.

Fig. 29 shows the larva partly grown, the perfect moth, and the chrysalis.

The insect lives throughout the winter in its chrysalis state. The worm is of three

[*Mr. Bethune.*]

different colours, green, black, and brown, but all these varieties turn into the same moth. It is seldom numerous, though occasionally so, and is very voracious. These, I think, are all the insects feeding upon the potato plant which are worth mentioning.

THE LOCUST—*Caloptenus spretus.*

The locust is considered more particularly a grain insect, though it will eat anything of a vegetable nature. The name of the destructive locust of the west is *Caloptenus spretus*. In the years 1874, 1875, and 1876, considerable attention was attracted by this insect, from its ravages in the Western States and the north-western Provinces of the Dominion, and I gave accounts of it in our annual reports to the Government.

INVASIONS OF THE LOCUST.

The first recorded invasion by this insect was as far back as 1632, in the central portion of America, especially in Guatemala. In California, there are recorded invasions in 1722, 1746 to 1749, 1753 and 1754, 1765 to 1767, these being the most important during the last century. During the present century it has been observed from time to time, one of the worst invasions being in 1855, when it covered the States west of the Rocky Mountains. In 1856 and 1857, it invaded the country east of the Rocky Mountains, and it spread from Minnesota, Nebraska, and Kansas to the borders of Iowa and Missouri. At that time there was not a very large area of cultivated territory in Manitoba, and I have no knowledge that it appeared there then, though I have no doubt it did.

THE LOCUST IN MANITOBA.

In 1867, the time of the next great invasion, it extended still further east, and became common in Iowa and Missouri, as well as in the States to the west of the Mississippi and Missouri Rivers. But the visitation with which we are most acquainted was that of 1874, which was of the most terrible description, the ravages of the insect covering hundreds of thousands of square miles. It was exceedingly bad in the Province of Manitoba, destroying most of the crops there—so bad, indeed, that some people were reduced to starvation, and assistance had to be given them.

TERRIBLE LOSS TO THE UNITED STATES—A COMMISSION.

The loss to the United States from the locust in 1874 was estimated at upwards of $40,000,000. The Federal Government, looking upon this as a national disaster, appointed, at the petition of the American Scientific Association, a Commission of three of the ablest entomologists in the country, to investigate the matter, and granted a large sum of money for the purpose of carrying on the investigation. The Commission was composed of Prof. Riley, Dr. Cyrus Thomas, and Professor Packard, three men whose names are highly esteemed by entomologists everywhere.

WORK OF THE COMMISSIONERS.

They divided the country between them, and travelled all over the Western States, as far as the Rocky Mountains, Mr. Riley also coming into Manitoba and the Assiniboine and Saskatchewan territories. They obtained very full and satisfactory information as to the locust, in the gathering of which they were very materially assisted by the Signal Service Bureau, and before the close of their operations they were enabled to send news in advance, when the hordes of locusts were approaching, so that people might have an opportunity of preparing for them.

[*Mr. Bethune.*]

THE BEST REMEDY.

The most efficient remedy which they proposed was to invade the haunts and breeding-places of the insects, and destroy them in the egg state. Their eggs are laid in the dry arid plains, on the slopes of the Rocky Mountains, and the Commissioners thought if a sufficient force of men were sent to these breeding-places at the proper time, and acting under proper instructious, they might destroy very large numbers of the insects, before they are developed at all.

HISTORY OF THE LOCUST.

The life history of this insect in a few words is as follows:—They are hatched out in these plains in countless numbers, eat up everything before them, and consequently become destitute; instinct compels them to move on, just as in the case of the army worm, and being winged insects, they fly up into the air to a considerable height, and are then borne along by the wind, alighting when they reach a country covered with vegetation.

THE COURSE OF THEIR FLIGHT.

Not being able to fly against the winds, their flight during the latter part of summer has been found to be invariably from the north and northwest towards the east, this being the direction of the then prevailing winds. They then deposit their eggs, from which are hatched out next spring, new insects. In the spring the prevailing winds are in an oppo site direction, and the new insects, having obtained their wings, are carried back towards their original haunts, whence, in turn, fresh hordes are borne to the east.

NEVER FAR EAST OF THE MISSOURI RIVER.

They have never come much east of the Missouri River, and I think the Mississippi will be found to be their extreme limit eastward. This was the conclusion Professor Riley came to, so that we need never fear them in Ontario. The insect devours in all its stages.

THE RED-LEGGED GRASSHOPPER—*Caloptenus femur-rubrum.*

We have an insect here that is almost identical with what is called the "hateful western locust," viz: the *Caloptenus femur-rubrum*, the common red-legged grasshopper, the main difference being that its wings are shorter, and that it consequently has not the same powers of flight, being able to fly only a few yards at a time. Our own grasshopper is occasionally very destructive indeed, and if it had equal powers of flight with the western locust, would be every whit as formidable.

Fig. 30.

THE GRASSHOPPERS IN MUSKOKA.

To Mr. Dymond.—Some seven years ago there was an invasion of this grasshopper in Muskoka, I should say the appearance of the insect in that part of the Province at that time was partly due to the great increase which had taken place, within a short time, in the cultivated area of the country, thus affording the grasshopper a much more abundant supply of food, and partly also to the favourable season.

CAUSE OF DIMINUTION OF NUMBERS.

Its subsequent diminution in numbers may be accounted for by the absence of natural checks. At the time of the insect's appearance its checks were probably a season or two behind it, and they required that length of time to overtake it, and reduce its numbers.

THE BREEDING GROUNDS.

Our grasshopper does not, I think, breed in woods or forests, but in more open

[*Mr. Bethune.*]

grounds, such as meadows or cultivated lands. It was the experience of the Rocky Mountain Commission that the western locust propagated entirely in plains where there was no forest life at all.

PARASITES OF THE GRASSHOPPER.

A very large number of parasites prey upon our common grasshopper. One of these is a very peculiar creature, commonly called the "hair-snake," sometimes seen in water. This feeds upon the interior of the body, and fatty parts of the grasshopper, and I have no doubt keeps its numbers down to a very considerable extent.

A DEADLY FUNGUS.

It also appears to me—though I have not investigated the matter thoroughly enough to speak with certainty—that there is a disease which affects the grasshopper, of a fungoid character, somewhat similar to that which affects the common housefly. At the close of summer they may be seen clinging to stalks of weeds, etc., quite dead, and apparently with a fungoid growth upon them.

PROPERLY A LOCUST—THE TRUE GRASSHOPPER.

What we call a "grasshopper" is really a locust. The grasshopper, properly so called, is a grayish-green insect, that feeds upon grass and foliage, and is never sufficiently numerous to do much damage.

THE CICADA.

There is another insect, sometimes called a "locust," which is not a locust at all, viz. the *Cicada*. It is a very familiar creature, and may be known by the peculiar, shrill, whizzing sound which it makes in the trees during the heat of the day. It is not very destructive in this country, its larvæ feeding upon the roots of forest trees, and occasionally also on those of the apple tree.

THE SEVENTEEN-YEAR LOCUST.

One peculiarity of the Cicada in the United States is, that one variety of it appears once in seventeen years, and another once in thirteen years. This belief was long popularly held, and was thought to be unfounded, but Prof. Riley demonstrated that such was really the case.

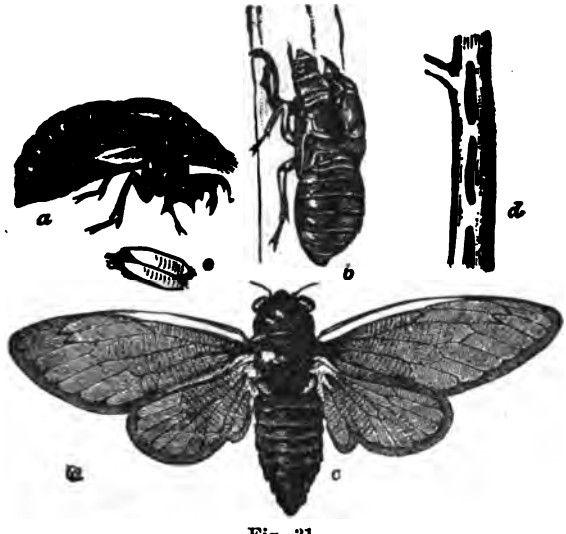


Fig. 31.

Fig. 31 represents different stages in the life-history of the 17-year locust. (*a*) is the pupa; (*b*) the empty pupa-case after the perfect insect has emerged from it; (*c*) the perfect or winged insect; (*d*) the perforations in a twig for the deposition of eggs; (*e*) the egg.

[*Mr. Bethune.*]

THE PHYLLOXERA.

To Mr. Saunders.—The *Phylloxera vastatrix*, which has proved so destructive to the vineyards of France, belongs to the same tribe as the plant lice. There are two varieties, one "gall-inhabiting," that is, making excrescences upon the leaves of the vine (Fig. 32.),

Fig. 32.

and the other attacking the root.

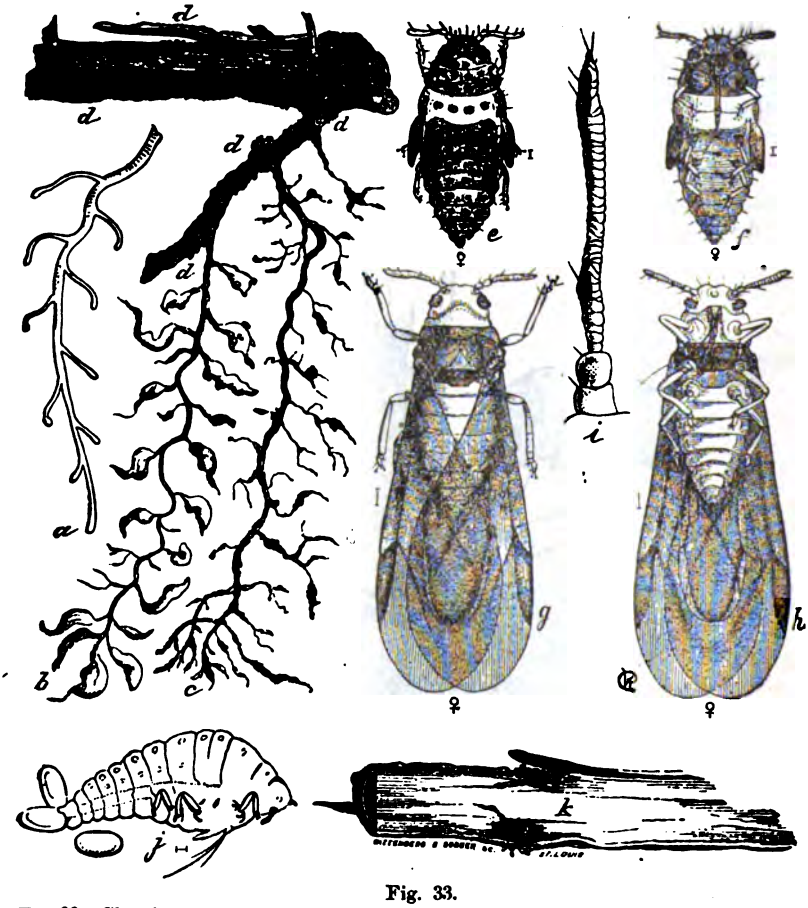


Fig. 33.

Fig. 33.—Showing the insect in its different stages of growth ; also a diseased vine root. [*Mr. Bethune.*]

At first these were thought to be separate species altogether, entirely different as they are in habits, and differing also in appearance, but Prof. Riley demonstrated, what had been suspected by some French entomologists, viz., that they were merely two forms of the same creature, and that the insect had two different modes of life. It has been enormously destructive in France, and has done considerable damage in some parts of the United States, but no injury of any account has been traceable to it in Canada.

THE GALL-INHABITING VARIETY.

The gall-inhabiting variety is common enough here, but this form of the insect is comparatively harmless. One peculiarity of this variety is, that they are all females, while those which attack the roots are both wingless females and winged males and females.

THE ROOT-ASSAILING VARIETY.

The males appear in August and September for the purpose of propagating the species. In the following year the insects attack the soft fibrous root of the plant, causing them to swell and gradually rot away. The plague was at first supposed to be a rot on this account. The insects of course extract from the roots the juices which should go to the nutriment of the plant, thus giving the leaves a sickly appearance, which is usually the first indication of the presence of the pest.

DISAPPEARANCE OF THE INSECTS.

When the work of destruction is pretty nearly finished, during the last years of the plant's life, the insects entirely disappear, and it was for this reason that it was so long before the insect was discovered.

THE ONLY KNOWN REMEDY.

The only efficient remedy against the root form is drenching with water. In Europe, the vineyards are mostly situated on hillsides, so that there is great difficulty in applying this remedy. On level plains, however, a mode of irrigation on a large scale has been introduced. Water is let into the vineyards during the autumn and winter months, and let away in the spring, no permanent injury being done to the plants. The simplest remedy for the gall-inhabiting form, is to pick the leaves off and burn them.

THE GRAPES LIABLE TO ATTACK.

The gall form attacks the Delaware and Clinton grapes, and the root form the Delaware, Hartford, Isabella, and Crevelling. The Concord is attacked, though very slightly, by both forms. Our climate is too moist for the comfortable existence of the root form, and even if the grape should come to be much more extensively cultivated in this country, than at present, I think our climate would grant us immunity from this pest.

THE HOP APHIS—*Aphis humuli.*

In England, the growth of the hop is almost dependent, from year to year, upon the appearance or absence of the "fly," or aphis, otherwise *aphis humuli*, though, in this country, we are not troubled by it to the same extent. It is not necessary to give an account of the life-history of this insect, as that given of the grain aphis, will also apply to this variety. It has probably come to this country from England, though the hop is an indigenous plant here, as I have observed it growing on the Kaministiquia River, where it is not at all probable it had been planted, and it is also found growing wild in many parts of the North-West. It is, therefore, not impossible that the insect may have existed here before its introduction from England.

[*Mr. Bethune.*]

EFFECT ON THE PLANT.

Like the other *aphidæ*, it lives upon the juices of the plant, and sometimes appears in such enormous abundance as to completely destroy it. It renders the plants blighted and withered and utterly valueless, attacking the tender foliage, twigs, and extremities of the growing parts.

THE MOST EFFECTIVE REMEDY.

A most effective remedy is the use of a decoction made by steeping cheap or refuse tobacco in boiling water. This is certain death to the insect when syringed or drenched with it. Again, very strong soap suds may be used with good results, and their value is very much increased by dissolving in them some salt and saltpetre. Lime water is also used.

THE PARASITES.

This aphis, like all the others, is kept very much in check by the parasitic insects which I have mentioned before, the lady-birds, the lace-winged flies, the *syrphus* flies, etc.

HOP VINE SNOUT MOTH—*Hypena humuli.*

There is another insect very destructive to the hop, viz., the hop vine snout moth, or *Hypena humuli*. Hops were, and are, grown in the County of Peel to a considerable extent, and while living there, I found this insect very abundant indeed.

ATTACKS THE FOLIAGE.

Occurring in large numbers, it destroys the foliage of the plants, and so injures them that sometimes no hops fit for market are produced. It is a pale green worm, which appears in June; the moth appearing in July to lay its eggs, and another brood appearing later on, so that there are two broods in the year. When disturbed it lets itself down by a silken thread a short distance, and if let alone, climbs up again.

REMEDIES FOR THE PEST.

Strong tobacco water kills it as well as the aphis; dusting with lime or substances of of that kind seems to be very effective; while powdered hellebore is as good a remedy against it as against the currant worm.

OTHER ENEMIES OF THE HOP.

Some cut worms attack the hop, the young brood appearing in the early part of the season. There is also a caterpillar which attacks the crown of the root, numerous specimens of which I obtained from Mr. Magrath's hop-yard, at Credit, but never having succeeded in raising them to maturity, I do not know what moth they turn into. They, however, resemble very much the cut worm in appearance.

BUTTERFLIES FEEDING ON THE HOP.—*Grapta interrogationis—Grapta comma.*

There are also two or three butterflies which feed upon the leaves of the hop. One is the *Grapta interrogationis*, and another the *Grapta comma*. They are sometimes sufficiently abundant to be a nuisance to the hop grower, and particularly where only a few hops are cultivated for domestic purposes in the garden.

DESCRIPTION OF THE BUTTERFLIES.

The butterfly is a handsome one, chiefly of a reddish colour on the upper surface of the wings, and dull on the under surface, with some silvery markings, in the form of a

semicolon (mark of interrogation in Greek), or a comma, according to the variety. They fly about late in the autumn, as well as in the summer.

A DEADLY PARASITE.

They are very subject to the attacks of a parasite, a small ichneumon which lays its eggs in the caterpillar, and the grub hatched from these feeds upon the fatty portions of the caterpillar as long as it lives. After the caterpillar is transformed into a chrysalis and suspended in the usual manner, the grub completes its work of eating it up, and finally makes a hole through the shell of the chrysalis, coming out a little black fly. These are so common that, as a rule, the chrysalids that one gathers produce ichneumons rather than butterflies. Though these butterflies lay a large number of eggs, they are never liable to be a serious pest, on account of the checks imposed by these ichneumons.

—*Thecla humuli.*

Another very pretty little butterfly and small caterpillar, the *Thecla humuli*, feeds upon the hop to a limited extent.

—*Plusia balluca.*

Fg. 34.

A moth, known as the *Plusia balluca* (Fig. 34), feeds upon the hop, but is not common enough to be destructive. The wings are of a brilliant metallic green colour, and the insect is a very beautiful one.

A STINGING CATERPILLAR.

Another moth is the Io Emperor moth (*Hyperchiria varia*). This caterpillar has won

Fig. 35.

[*Mr. Bethune.*]

some distinction over our other caterpillars by being possessed of a stinging property. It is covered with bands of bristles, and when they pierce the tender skin of the body they produce an irritation similar to that caused by nettles. It grows to a considerable size, and when coiled up, somewhat resembles the burr of a chestnut. It has a rich reddish-coloured stripe extending on each side of the body throughout nearly the entire length, rendering it, in combination with the yellow spine-rings, a remarkable insect, and one that can be easily identified. It feeds upon a very large variety of trees, shrubs and plants, amongst others, upon the hop.

THE CHRYSALIS.

The chrysalis is formed in the autumn, and the moth comes out in the following spring. The male (see Fig 36) and female (see Fig. 37) differ in size and colour very

Fig. 36.

Fig. 37.

considerably, but both are marked with large spots like those on a peacock's tail. These moths are never sufficiently numerous to be classed as really destructive insects. The insect pests I have mentioned are all I know of that trouble the hop.

THE PEA WEEVIL—*Bruchus pisi.*

To Mr. Dymond.—The pea weevil, or *Bruchus pisi*, is an importation from Europe. For some time we were comparatively free from it in Canada, but of late years it has been allowed to extend its ravages, so that the Americans, who formerly obtained their seed peas here, have ceased to do so. The matter is consequently one of very practical interest to the farmer. Manitoulin Island is, I believe, still free from this pest, but it is now prevalent throughout Ontario.

[*Mr. Bethune.*]

HABITS OF THE PEA BUG.

It is a very remarkable creature in its habits. The parent insect is a little beetle, which deposits its eggs in the blossom of the pea, just before the petals fall. The egg hatches out a little worm which penetrates down inside of the growing pod, fastens upon and enters the young pea. The hole which it makes when entering the pea is completely filled up by the subsequent growth, consequently when the pea is ripened the insect is found inside without any visible aperture at all, and the wonder to the ordinary observer is, how the creature ever got there. The pea develops in the ordinary way, and seems to grow as large as usual, but, of course, is very deficient in weight. The insect does not eat away the whole interior of the pea, but simply a hole in it, in which it goes through all its transformations. When it arrives at the stage of the perfect beetle, it gnaws its way through, flies away, and appears again to lay the eggs for the next crop of insects. I have no doubt these insects are eaten very often in peas which are brought to the table, but having fed upon nothing but the pea, they have no taste, and do harm to nobody.

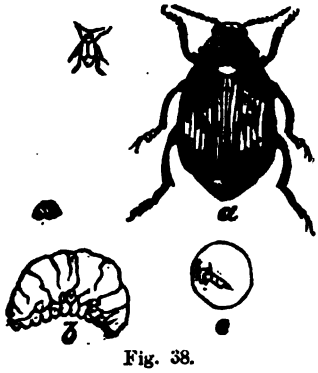


Fig. 38.

INFESTED PEAS GERMINATING.

I think that some proportion of infested peas germinate. The beetle eats away the starchy portion of the pea without injuring the germ, probably because the latter is of a different constituence. This pest has affected the sale and price of peas in Ontario very largely.

A REMEDY.

One remedy, which I have seen practised, to avert the pest it is to keep the seed peas, if they are observed to be infested at all, over the year in tight vessels. The peas, for instance, are gathered this year, and next year the beetle would mature and come out of them, and being unable to escape from the vessel it would die. There would be no place to lay its eggs, or, if any eggs were laid, they would be valueless. If these peas were sown the following year, many of them would probably die, but a very large proportion would retain their vitality and germinate, and the ensuing crop would be entirely free from the bug.

ANOTHER REMEDY.

Another remedy is to pour water which has been heated almost to the boiling point over the peas, a few seconds exposure to the water sufficing to kill the insect, but not the vital part of the plant. This method of treatment, however, would have to be carried out with a great deal of care. I have noticed that a very large number of the infested peas will float on the water, while the uninfested ones will sink to the bottom, during a brief immersion. The sound peas might in this way be roughly separated from the unsound, but it would not be a complete mode of separation, as in many cases only those in which the greater portion of the interior had been eaten out would float. The method of keeping the seed peas over a year is the simplest way of destroying the bug, and farmers would find it greatly to their advantage to practise it, if they could get sufficiently ahead with their supply of seed to enable them to do so. I don't think the plan of proscribing districts where the bug has been a great pest would be of much practical value, and I fear if this remedy were adopted, and carried out in a locality, in a very few years the bug would be as numerous as ever before, unless the farmers would all unite in refusing to sow any infested grain.

[*Mr. Bethune.*]

AN IMPORTATION FROM THE STATES.

This Province was free from the insect, almost entirely, not many years ago, and it has been imported from the United States, where it has existed for a very much longer time.

LATE SOWING SUGGESTED.

I remember proposing some years ago, as a measure of protection, that the seed should be sown very late, but that would be a very ticklish remedy, as the danger would be very great of the crop not maturing. Another remedy I proposed was that some good seed of an early variety should be sown very early in the spring, and that, as soon as the crop matured, a portion of it should be sown again, in order to get a second crop the same season, in which the beetle would not have time to mature. Such a plan is possible with great care, but it is not an easy thing to carry two crops of peas to maturity in one year.

THE ALGOMA DISTRICT FREE FROM THE BUG.

Mr. Saunders stated that the Algoma District was entirely free from the bug, and that it consequently afforded a field from which to obtain a supply of uninfested seed peas. It would appear that the insect did not thrive there, for he (Mr. Saunders), had known infested peas to have been sown without any subsequent appearance of the bug.

Mr. BETHUNE, resuming, and in reply to Mr. SAUNDERS, said :—

THE CABBAGE BUTTERFLY—*Pieris rapæ*.

The insect most injurious to the cabbage at the present time is a recent importation from Europe, the *Pieris rapæ*, or cabbage butterfly.

Fig. 39.

Fig. 40.

Fig. 41.

Fig. 39 shows the male ; *Fig. 40* the female ; and *Fig. 41 (a)* the larva, and *(b)* the chrysalis.

[*Mr. Bethune.*]

This insect appears to have come over from England or Ireland in one of the Allan line of steamers.

FIRST APPEARANCE, AND RAPID DISTRIBUTION.

It was first observed in the neighbourhood of Quebec, in 1859, by Mr. Couper. It found itself at home there at once, as cabbages are very largely cultivated by the French Canadians. By degrees it spread westward and southward, until it now covers all the Eastern, and most of the Middle States, as well as the Province of Ontario, and is even found as far south as Virginia.

THE FIRST ATTACK SEVERE.

Its first attack in any locality is generally excessively severe, almost entirely destroying the crop of cabbages and cauliflowers. In about two years, however, its numbers gradually diminish, until it becomes only a moderate pest, as it is with us now.

A PARASITICAL DESTROYER.

This diminution is entirely owing to the work of a minute parasite, an ichneumon, called *Pteromalus puparum*. This insect is very familiarly known in England, where it keeps the butterfly down, so that it is never very seriously destructive, except in occasional years, as in the case of most other insects. It carries on its operations in precisely the same way as the parasite I have described as attacking the hop butterflies, completing its destruction when in the chyrsalis form, and emerging therefrom in the shape of a minute winged fly.

SINGULAR CHANGE OF COLOUR.

It is rather a singular thing that since the butterfly has become indigenous on this continent, it has undergone a considerable change in colour. The under surface of the wings of most specimens is now decidedly yellow, while in England the yellow variety is almost unknown.

APPLICATION OF POISON DANGEROUS.

It is not easy to employ poison as a remedy for the insect on the cabbage and cauliflower without incurring the risk of poisoning the vegetable, but a good deal can be done by hand picking and by catching the butterflies. The larvæ will of course succumb to hellebore, but this is not a pleasant thing to apply to the vegetable.

RAPID SUCCESSION OF BROODS.

There is, unfortunately, a constant succession of broods; we find the larvæ and butterflies in all stages, from early in the season until late in autumn; in fact, the butterflies are at this moment engaged in laying their eggs. Their ravages, happily, are not at their maximum during the early stages of the plant, and a good deal may be done by destroying the insects at this time.

HOT WATER A REMEDY.

Hot water or brine, I should think, might also be employed with good effect. The hot water should be just under the boiling point, and if applied when at that temperature will not hurt the plant.

PERSIAN INSECT POWDER.

The powders known as the Persian insect powders would, I think, also be very effective, and the same objection would not apply to them as to the other poisons. I do not

think we need fear this insect now as a very grievous pest, though it will always be a nuisance.

TWO NATIVE BUTTERFLIES—*Pieris casta*—*Pieris protodice.*

There are two native butterflies of the same genus, which feed upon the cabbage, viz., *Pieris casta* or *oleracea* and *Pieris protodice.* These, however, are now quite rare. The *casta* or *oleracea* is the more northern, and the *protodice* the more southern, but their habits and appearance in the larval and chrysalis states are very similar.

THE ZEBRA CATERPILLAR—*Mamestra picta.*

The zebra caterpillar or *Mamestra picta* (Fig. 42, *a*,) a very handsome caterpillar, beautifully marked with different colours, feeds upon the cabbage and a number of other plants, and turns into a dull coloured moth (Fig. 42, *b*)—one of the night-flying moths.

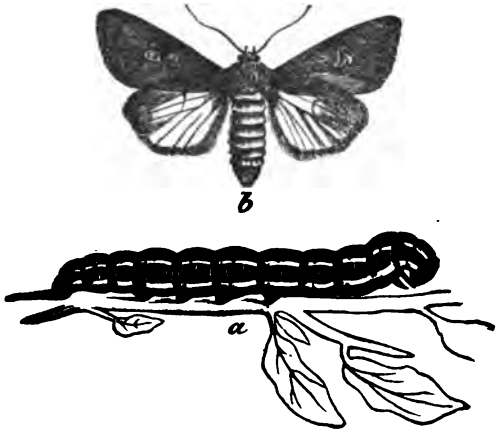


Fig. 42.

This insect is sometimes very abundant and destructive, but it is not common here.

THE CABBAGE PLUSIA—*Plusia brassicæ.*

The cabbage plusia, or *Plusia brassicæ* (Fig. 43), turns into a moth and feeds very freely upon the cabbage and cauliflower, and other plants of that character.

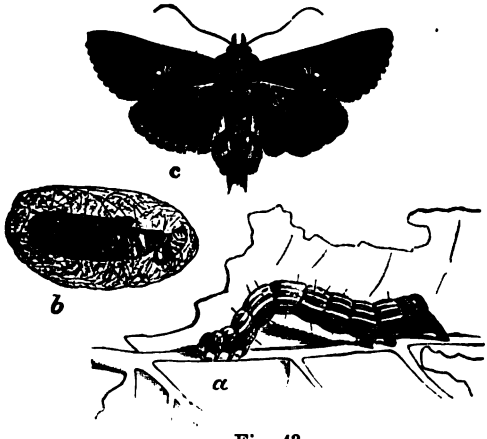


Fig. 43.

[*Mr. Bethune.*]

The same remedies that would apply to the cabbage butterfly would apply to these others that I have named. The cabbage-worm, or *rapæ*, is of a green colour, and so closely resembles the plant that it is very difficult to detect it without a little experience, while these two caterpillars are large—the zebra especially being highly coloured—and can be easily seen.

Fig. 44.

THE HARLEQUIN CABBAGE BUG—*Strachia histrionica.*

The harlequin cabbage bug, or *Strachia histrionica* (Fig. 44), is a very great pest to the market gardeners in the States south of us, but has never, to my knowledge, been found in Canada. It is a very unpleasant member of the bug family and sucks the juices of the foliage.

CUT-WORMS ON CABBAGES.

The cabbage plant, in its young stages, is very liable to the attacks of cut-worms.

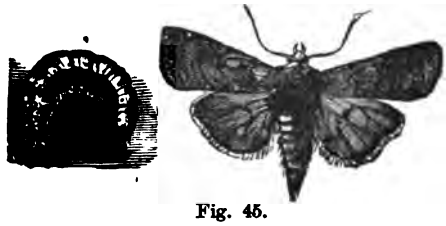


Fig. 45.

Fig. 45 shows the larva and moth of the dark-sided cut-worm (*Agrotis messoreia*), one of our commonest species.

Every gardener is familiar with the annoyance, after he has set his plants out, of finding them in the morning cut down and dead.

HABITS OF THE CUT-WORM.

This is the work of a caterpillar that hides under rubbish in the day-time, and comes out only at night. It divides the stem of the cabbage, pulls down the foliage, and feeds upon it during the night.

REMEDIES FOR THE CUT-WORM.

One remedy is to dig around the plants that have been cut, bring up the insect and kill it. Another of the best remedies is to wrap a piece of stout paper around the stem of the plant when setting it out; place it a short distance below the surface of the ground, and a short distance above, so as not to interfere with either the root or leaves of the plant, and it will be found a pretty good protection against the cut-worm. Sometimes soot is put about the stem just on the surface of the ground, sometimes ashes, and sometimes salt. If the paper is used it will be found that by the time it becomes soft and useless, the plant is beyond the stage at which the worm is harmful. These cut-worms attack vegetation of all kinds, and are especially troublesome to young plants.

A PINE TREE BORER—*Monohammus Confusor.*

There are a number of wood-boring insects which attack our forest trees, the largest of the pine tree borers being the *Monohammus confusor*. This insect is remarkable for the enormous length of its antennæ or horns, which extend sometimes to twice the length of its body, the latter being probably an inch and a half long, thus making the antennæ three or four inches in length. They are, besides, curiously jointed and form a curve usually branching out on each side.

[*Mr. Bethune.*]

HISTORY OF THE PINE BORER.

The insect is produced from a very large grub, of a whitish colour, with a large broad head and very powerful jaws, with which it cuts into the timber of the trees. It is not a very common insect in this part of the country, but in the Ottawa lumber districts, and in the lumbering regions north of Peterborough, it has frequently been very abundant and very destructive.

HABITS OF THE PINE BORER.

Its habit is to attack timber that has been injured, usually by fire, or blown down by the wind; it does not attact green, flourishing timber. It frequently happens that forest fires will sweep over a number of square miles of timber during one summer. If the fallen or injured timber is not cleared away the same summer it is liable to be destroyed by this beetle. In the following spring the parent beetles frequent this burnt district and lay their eggs on the trunks of the trees which remain standing. From these eggs hatch out the grubs, which gradually penetrate into the interior, and burrow long chambers through and through the tree. Where they are very numerous they will honeycomb the wood to such an extent as to make it quite useless for building purposes. Consequently in the Ottawa region particularly, it is a race between the lumberers and beetles as to which shall secure the timber after a fire has scorched a district. It is also very destructive to timber that has been cut and left in the woods, as saw logs; though in this case stripping off the bark is a remedy.

EXTENSIVE DAMAGE.

The damage caused by this, the largest wood-boring beetle in this country, especially in the Ottawa regions, is very large, so large, indeed, that it is said one timber-limit owner lost by its ravages, in a short time, over $150,000. There is no means of checking the operations of the insect except by manufacturing the timber as soon as possible, and taking it away.

ANOTHER BORER—*Monohammus scutellatus.*

We have another insect of the same species, the *Monohammus scutellatus*, so called because its scutellum, which is a small triangular portion of the insect's structure between the two outer wing surfaces, is perfectly white, and consequently conspicuous. In colour it is black, slightly marked with whitish spots, while the *confusor* is an ashen gray, and in fact very much the colour of the bark of the tree.

HABITS OF THE SCUTELLATUS.

The habits of the *scutellatus* are somewhat similar to those of the *confusor*, while it is a much more abundant insect. I have seen it in various parts of Canada, chiefly on fallen timber of the spruce or fir variety. One frequently finds both these beetles in houses that have been built for about a year. The grub arrives at maturity in some of the timbers, and the perfect insect makes its appearance, to the great astonishment of the inmates of the dwelling.

OTHER DESTRUCTIVE SPECIES.

The other wood-borers, that are particularly injurious, belong to the *Buprestis* family, of which there are three or four species that affect forest trees. This is a family very closely allied to the "springbacks," of which I was speaking a little while ago, being very similiar in shape, but for the most part distinguished by a brilliant metallic appearance.

CHALCOPHORA LIBERTA.

The *Chalcophora liberta*, and *virginica*, on the under side present the appearance of burnished copper, while the upper surface is of a duller hue, but still with a metallic

sheen running through the ground colour. Their larvæ are long grubs, with large, flat heads, disproportioned to the size of the body. They perforate through the timber, much in the same way as the *Monohammus*, but their burrowings are not quite so large. There are a great many species, and although their history is not thoroughly known I have no doubt there is a species attached to almost every one of our forest trees.

A MAPLE BORER—*Clytus speciosus.*

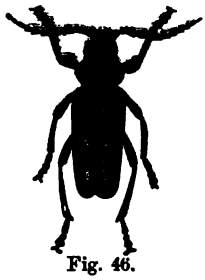


Fig. 46.

There is a borer which attacks the maple called the *Clytus speciosus*, an extremely handsome beetle. (*See Fig. 46.*) It is velvety black in colour, with stripes and markings of a bright yellow. The abdomen is tinged with yellow, so that a casual observer might easily mistake the insect for a very large wasp. The perfect insect is occasionally found on flowers. All of these insects in their grub state bore into the timber of the wood, making the channels and chambers which are familiar to everybody, while the perfect insects have apparently no particular resort, and after they emerge from the wood are occupied for the remainder of their life in providing for the continuation of the species.

NO KNOWN REMEDY.

It seems impossible to suggest a remedy for this sort of insect, and any remedy would be very difficult of application owing to the immense number of trees, and the great care necessary to ascertain which are the infested ones. There is no doubt that there are parasites attached to these insects, but entomologists have not yet studied the matter thoroughly enough to ascertain exactly what they are.

A LOCUST TREE BORER—*Clytus flexuosus.*

Very closely allied to the *Clytus speciosus* is the *Clytus flexuosus*, which attacks the locust tree. It is a little more wasp-like, but is very similar in appearance and is sometimes seen on the "golden rod" and other plants in the summer time. The grubs of this insect bore through and through the trunks and limbs of the locust tree, gradually killing it. Some years ago it was very abundant in the neighbourhood of Toronto, and killed most of the locust trees from Toronto to London. I have also found immense numbers about the Credit and other places, but now, I think, it has to a large extent disappeared.

METHOD OF ATTACKING A TREE.

When it attacks a tree, little masses of what looks like sawdust may be seen in the forks, at the base, or adhering to the bark. These are the fragments of the wood which the grub casts out during his borings. Swarms of flies and other insects attracted by these castings also betray the presence of the borer.

MODE OF DESTRUCTION.

It may be killed by inserting a wire into the hole which it has made in the tree, but a more effective remedy is the application of very strong soap-suds to the stems and branches, especially when the attack is first noticed. As the beetle gets older and stronger it penetrates more deeply into the tree, and is not so easily reached. This treatment would prove equally effective in the case of the maple tree borer.

[*Mr. Bethune.*]

ORTHOSOMA CYLINDRICUM.

The *Orthosoma cylindricum*, which belongs to the same family as the *Monohammus*, is a large chestnut-brown beetle, with long antennæ. (*See Fig. 47.*) It is familiar to most people from its habit of coming into houses at night during the summer time, attracted by the light, and knocking against the ceiling, lamps, etc.

Fig. 47.

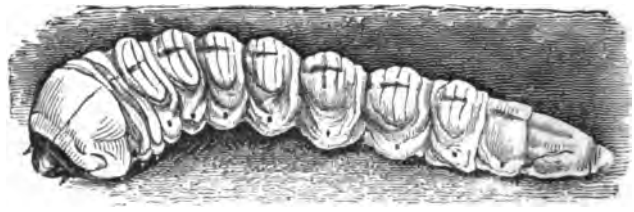


Fig. 48.

The Larva (*See Fig. 48*) bores into the wood of various sorts of pine, and is much more common in this part of the country than the *Monohammus*, which is confined almost entirely to the lumbering regions, while this insect is found everywhere throughout the Province. The presence of these large pine-borers can generally be known by the noise which they make while at work. On a still night the crunching of their jaws can easily be heard at a distance of several rods, and by listening intently, the exact spot can be found where the creature is hard at work. Most of these large borers attack only trees that have met with some injury, whether from wind or fire, but the *Clytus* borers will attack perfectly healthy trees.

MINUTE ENEMIES OF FOREST TREES.

There are a number of other insects which attack the wood of our forest trees, such as the *Scolytus* family, and others, but they are smaller in size, some of them being very minute indeed. They chiefly work just beneath the bark of the tree, and I do not know that they do any great amount of damage. Some of them penetrate the small twigs and shoots, and do injury in that way. They do not, as a rule, attack live, healthy trees, but if the bark has become loose from any cause, they are apt to get under and damage the wood.

IMPORTANCE OF DISCRIMINATION BETWEEN INSECTS.

To Mr. Dymond.—I think it would be very desirable if the community in general were able to distinguish between insects that are really beneficial and those that are really injurious. Most people will trample under foot any insect they come across, particularly if its appearance is not very inviting, and numbers of those that are put to death in this way are our very best friends.

BENEFICIAL INSECTS—ORDERS OR DIVISIONS.

Beneficial insects come under four or five great orders or divisions. We will take the beetles first of all.

THE TIGER BEETLES—*Cicindelidæ.*

Of these, the family of *Cicindelidæ*, or tiger beetles, is generally put first in classification. There are a great many species of these beetles, and they are very handsome,

[*Mr. Bethune.*]

and remarkable in their habits. (*See Figs. 49 to 53.*) The larva (*See Fig 54*) or grub lives in a hole, and when any insect comes near the opening it grasps it with its mandibles, and devours it. In the perfect state it is very lively, as its long legs and ample wings enable it to run and fly with great rapidity. It is generally found in warm, sandy situations, by the road sides or pathways, and with its powers of flight and running, it is able to catch almost any insect that comes near it. They devour a very large number of insects, and while they are probably not very particular as to whether the creature they destroy is harmful or not, they are generally looked upon as beneficial from their carnivorous habits.

Fig. 49.

Fig. 50.

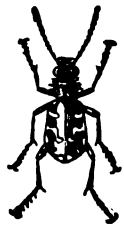


Fig. 51.

Fig. 52.

Fig. 53.

Fig. 54.

The preceding five figures exhibit some of the common species:

Fig. 49.—The common tiger beetle (*Cicindela vulgaris.*) *Fig. 50.*—The purple tiger beetle (*C. purpurea.*) *Fig. 51.*—The hairy necked tiger beetle (*C. hirticollis.*) *Fig. 52.*—The six spotted tiger beetle (*C. sex guttata.*) This last is a most beautiful insect, of a brilliant colour. *Fig. 53.*—The large tiger beetle (*C. generosa.*)

THE GROUND BEETLES—*Carabidæ.*

The next family of beetles is the *Carabidæ*, or ground beetles, which live under stones, or rubbish, or things of that kind. Some of them appear in the daytime, but they work chiefly at night, and both in their grub and perfect states destroy large numbers of insects. Some are especially useful in destroying the larva of such insects as the potato-beetle, and various kinds of caterpillars.

OTHER VARIETIES OF BEETLES.

The genus *Harpalus* is especially valuable in this way. Some of them are large and handsome. Then there is the genus *Calosoma*, of which there are two or three species, one of them (*See Fig. 55*) being a large beautiful green beetle called the "caterpillar hunter," from its habit of going up trees, and seizing upon and devouring caterpillars. We do not know a very great deal about the habits of these insects. This year I found the large *Calosoma scrutator* as well as the *Calosoma frigidum* very abundant at Port Hope. Another species, called the *Calosoma calidum* (*See Fig. 23*), also a large and handsome beetle, destroys a great number of caterpillars and noxious insects.

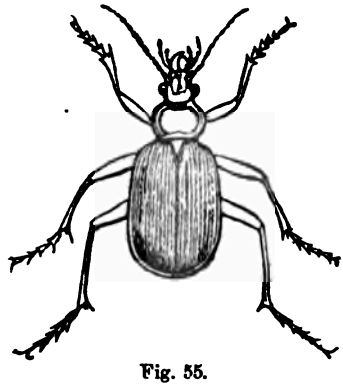


Fig. 55.
Calosoma scrutator.

INSECTIVOROUS EXCLUSIVELY.

To Mr. Saunders.—So far as we know, all the members of this family, both in their larval and perfect states, live on nothing but insects, consuming no vegetable food at all. There is a very large number of species of this family, but I do not think it necessary to enter into a detailed account of them.

[*Mr. Bethune.*]

WATER BEETLES—SEVERAL FAMILIES.

Fig. 56.

Fig. 57.

Fig. 56 represents the largest of our species of Dytiscus *(D. Harrisii.)*
Fig. 57. A species nearly as large, *Hydrophilus triangularis.*

Proceeding in scientific order, we next come to the water beetles, of which there are several families, as the *Dytiscidæ* and *Gyrinidæ*. They live in the water, and in both their larval and perfect stages, destroy a large number of insects, including the larvæ of mosquitoes, which are bred in the water.

THE SCAVENGERS.

Fig. 58.

Then we have some insects that are indirectly beneficial, such as the families *Sylphidæ* and *Staphylinidæ*, which act as scavengers. The former live upon carrion, and some of them have the very useful habit of burying small dead animals, not, however, with the object of removing the offensive objects from our sight, but of laying their eggs in them, and thus providing food for the grubs which are there hatched out. Others feed upon dead fish thrown up on the shores of our lakes and rivers. The *Staphylinidæ* have much the same habits but they live upon decayed vegetable, as well as decayed animal matter.

Fig. 58 represents *Necrophorus velutinus*, one of our commonest species.

THE SCARABAEIDÆ.

The *Scarabaeidæ*, to which family belongs the sacred beetle of Egypt, may also be classed among the beneficial insects. The peculiarity of these creatures is, that the hindmost pair of legs are very close to the hinder extremity, and are very large and curiously shaped. They go to the droppings of animals—horse-dung for instance—and roll a quantity into a ball, which they push along the ground for some little distance. They then dig a hole and bury the mass, having first laid in it an egg. These insects are common in this country, and are useful in removing animal excrements from the surface of the ground. There are a number of similar insects that also feed upon refuse of that kind, and so are beneficial, but the great majority of the insects belonging to the family of *Scarabaeidæ* are excessively noxious to vegetation. Nearly all except the few genera which I have just referred to are leaf-eating, as the common June-bug, and the spotted grape-vine beetle, and others which also belong to this family. The next family which we look upon as beneficial is the *Lampyridæ*, to which the fire-fly belongs.

[*Mr. Bethune.*]

A CURCULIO DESTROYER.

We do not know much about their habits, but there is one in particular that is exceedingly useful, the *Chauliognathus pennsylvanicus*, of which the larva or grub feeds quite freely upon the plum curculio (see Fig. 60). The beetle itself is a very pretty yellow, soft-bodied insect with some black markings on the wing cases (see Fig. 59). It is often found on the blossoms of thistles late in the summer, and it ought by all means to be protected. Judging from the habits of this insect we may presume that other members of the same family are equally beneficial, but nothing is positively known on this point. All other beetles, with the exception of one family, are noxious to vegetation, either as wood-borers or leaf-eaters.

Fig. 59.

Fig. 60.

THE LADY BIRDS—*Coccinellidæ*.

The remaining family is the *Coccinellidæ* or lady birds (*See Figs. 9–13*), of which there are a large number of species. These, both in their larval and perfect states, feed upon plant lice and small insects of that kind; some of them feed upon the eggs of the Colorado potato beetle, and probably some upon the eggs of other injurious insects.

ORDER OF HYMENOPTERA—THE ICHNEUMONS.

The next order of beneficial insects is the *Hymenoptera*, the family to which bees, wasps, and most of the stinging and piercing insects belong. It is not necessary to speak of bees as being beneficial, but I wish to say a few words as to the *Ichneumons*, which belong to this order. There are hundreds of different kinds of these insects varying in size from several inches in length down to a degree of minuteness that can scarcely be seen with the naked eye, but all prey upon other insects.

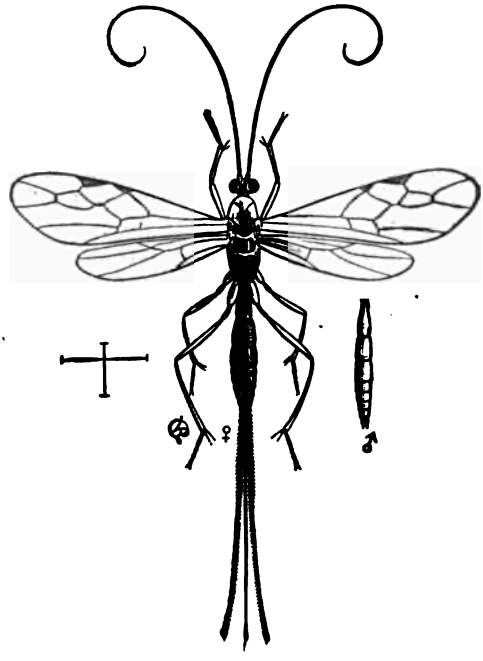


Fig. 61.

Fig. 61 shows one of these parasitic Ichneumons which destroys the coddling worm of the apple. This is known as the delicate long sting *Macrocentrus delicatus*.

[*Mr. Bethune.*]

HABITS OF THE ICHNEUMONS.

The perfect four-winged fly lays its eggs in the bodies usually of the caterpillars of all sorts of insects, and the young larvæ burrow into the living grub and gradually kill it. It is to these ichneumons, more than to any other cause whatever, that we owe our immunity from the ravages of destructive insects.

We have found at various times, that as soon as they became abundant, the pests were almost entirely exterminated, while, if they happened to be rare, the noxious insects thrived, in spite of all other checks. Some of the largest of the kind, with ovipositors three or four inches in length, will penetrate the thick bark of trees and fasten upon their prey. They are extremely numerous, and I suppose every species of insect has its own ichneumon feeding upon it and keeping it down. Wasps and hornets may be looked upon as partly beneficial and partly injurious. The large black hornet, with the white face, kills a good many house-flies.

THE ORDER OF DIPTERA, OR TWO-WINGED FLIES.

The next order of beneficial insects is the *Diptera*, or two-winged flies. The *Syrphus* flies, (see Figs. 16, 17) of which I have spoken several times already, belong to this order,

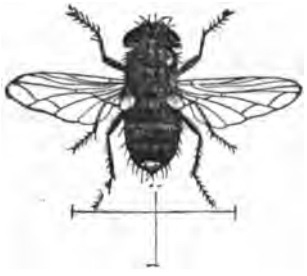


Fig. 62.

Fig 62 shows a Tachinus fly, a common parasite on caterpillars.

as well as the *Tachina* flies. Their habits are very similar to those of the ichneumons, but while the ichneumons have four wings, these insects have only two.

HABITS OF THE TWO-WINGED FLIES.

Their eggs are laid in the bodies of caterpillars, which the larvæ thus hatched out gradually kill. The mosquito may also be considered, in one sense, a beneficial insect. Its larvæ live in the water, and feed upon decaying organic matter found there. It is probably of assistance in reducing the amount of miasma in marshy places.

Some of the species belonging to the family *Hemiptera* are beneficial, while a large number are injurious. Some of the carnivorous bugs belonging to this order destroy a large number of insects, and, among others, the Colorado beetle in its larval state

THE ORDER OF NEUROPTERA—DRAGON FLIES.

The last order I need refer to is the *Neuroptera*, to which belong the handsome dragon-flies. These insects, in their larval state, live in the water, and are very ferocious, destroying a large quantity of the larvæ of other insects; while in their perfect condition, they fly about and kill great numbers of flies that are the parents of injurious insects. Notwithstanding the fact that they are promiscuous feeders, and perhaps prey upon some of the ichneumon flies, I think they may be classed as decidedly beneficial.

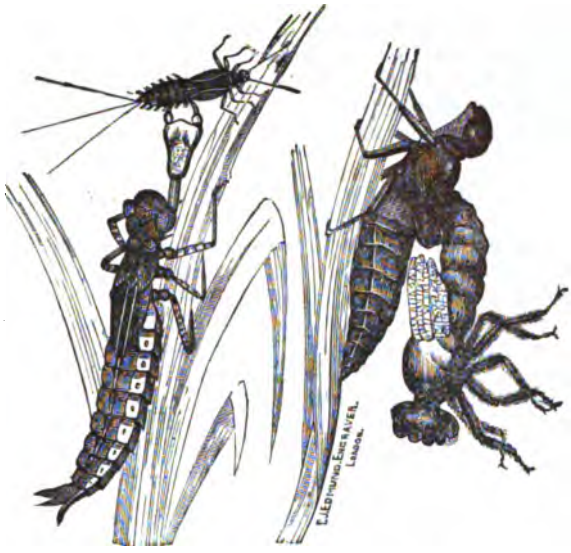


Fig. 63.

Fig 63.—In this figure we have represented the larva in the act of capturing its prey, and the pupa case, with the perfect insect just emerging therefrom.

Fig. 64.

Fig. 65.

Fig. 64 shows one of our most common Dragon Flies *(Libellula trimaculata)*, and *Fig. 65, L. quadrimaculata.*
[*Mr. Bethune.*]

The lace-winged flies to which I referred as feeding upon plant-lice, belong to this order. The perfect insect is very beautiful in appearance. Its wings resemble very fine lace, the body is green, and it has large prominent golden eyes, but unhappily it also possesses a very offensive odour. It deposits its eggs upon stems that are entirely out of proportion to the size of the eggs it lays, and which maintain them in an elevated position above the surface of the leaves or twigs on which they are deposited.

THE SPIDER FAMILY—*Arachnidæ.*

Spiders, though not properly termed insects, are highly beneficial. They belong to the group *Arachnidæ*, and are of the same class as the scorpions, and some other creatures of that kind. They destroy a large number of insects, mostly of the winged classes, though the more predacious spiders, that do not construct webs, prey upon other insects as well. The common web-spinning spider, though a source of annoyance to the tidy house-keeper, is of very great use in despatching house-flies and other insects, while notwithstanding the stories which are told us to the contrary, it is not at all poisonous or injurious in that way.

ENORMOUS LOSS FROM INSECT PESTS.

To Mr. Dymond.—It would be very difficult to estimate the damage sustained by the country from insect pests In order to do so, one would require to know the value of the agricultural and horticultural products of the Province, but I should think it very much within the mark to say that the loss from this cause annually, amounts to five per cent. of the entire crop. Indeed, I do not think that ten per cent. would be at all an extravagant estimate. Hundreds of thousands of dollars must be lost every year in this way. We can never hope to be entirly free from injurious insects, but if we could save even one per cent it would be an immense gain.

THE ENTOMOLOGICAL SOCIETY.

I think a great deal of good could be done by disseminating information as to these pests, by pointing out how they may be destroyed, etc., and I think very much has been done in this way by our Entomological Society. Our object has been to diffuse by means of our annual reports, information of this kind among the whole community, but especially among farmers and horticulturists, who are more particularly interested in the welfare of our grain and fruit crops. We have abundant evidence to show that this work of the Society has enlightened the minds of our people in regard to these things to a very large extent. Before our reports began to be issued, the great majority of our people knew nothing whatever about insects, while now most intelligent persons who read at all, have a moderate amount of information in regard to them, and are able to identify and distinguish between the more common kinds of beneficial and injurious insects.

PROTECTION OF BIRDS ADVOCATED.

I think our common birds ought to be protected. They add a great charm to the face of the country, both by the beauty of their plumage, and their singing, while they do not do damage enough to give us reason for killing them. But it is on humane and æsthetic and not on utilitarian grounds that I advocate their protection.

MOST BIRDS NOT DISCRIMINATING.

There are a few insectivorous species that are exceedingly useful, but the great majority of our birds do not discriminate in the slightest degree between insects that are injurious and insects that are beneficial.

[*Mr. Bethune.*]

THE ROBIN.

The robin, for instance, will eat very largely of the earth-worm, which is a decidedly beneficial creature, while it will pass the noxious tent caterpillar near by, and at the same time, if the strawberries happen to be ripe, it will not be backward in taking toll of them.

WOODPECKERS.

However, our woodpeckers are very useful as insect feeders, and the common yellow-bird also does good work in devouring the seeds of noxious plants.

PARASITIC INSECTS OUR BEST PROTECTORS.

But I think there can be no doubt that the parasitic insects are beyond all comparison our best protection against the ravages of noxious insects. I should be very sorry to see the robin exterminated, though I think he consumes a great deal of good fruit. A stuffed eagle or hawk, or other bird of prey, set up on a pole in the midst of the trees during the fruit season, has the effect of frightening away robins, cherry-birds, and other feathered thieves, though it sometimes loses its virtue from the birds becoming accustomed to it. I would not advocate the passing of an Act, taking away the protection of the law from such birds as the robin, while extending it to others. I think very great difficulty would arise from any such attempt at discrimination.

CHARLES J. S. BETHUNE.

MR. SAUNDERS' EVIDENCE.

Mr. WILLIAM SAUNDERS, a member of the Commission, then gave evidence as follows:—

To Mr. Dymond.—About twenty-two or twenty-three years ago I began the study of insects, and since that time I have been pretty constantly engaged in observing and noting the various phases of insect life, directing my attention more particularly to the insect enemies of the fruit-grower and the farmer, and to the habits of parasitic insects, inimical to these destructive species. I have been connected with the Entomological Society since its formation, and am at present editor of the *Canadian Entomologist*, and President of the Entomological Society, having occupied the former position some six or seven, and the latter four or five years.

ENTOMOLOGICAL SOCIETY.

As President of the Entomological Society, I have, in connection with my coadjutors, done the best I could, with the means at my disposal, to place before the farming portion of the community, in the annual reports presented to the Commissioner of Agriculture, matter that would be beneficial to them, while in the *Entomologist*, now nearly completing its twelfth volume, we have tried to advance the subject from a scientific standpoint. The work of the Society has, I think, been valuable, and the Government have been pleased to gradually increase the grant from $400 a year, the sum paid nine or ten years ago, to $1000 a year, at which it now stands. This money I may mention, is spent

entirely in providing material for carrying on the operations of the Society, the work which is done being gratuitous, and with the exception of $100 voted to cover the expenses of the editor, and $50 to cover those of the Secretary, the whole of the grant is spent in the way I mention, a strict account being rendered to the Government every year in the Society's report. The case is different with our Entomological friends, who have been doing so much for the United States, they are nearly all salaried officers; Prof. Riley, as State Entomologist of Missouri, had formerly $3000 a year, and now, as chief of the Entomological Commission, he is in receipt, I believe, of an annual salary of $5000, while the other officers of the Commission have $2000 and $3000 a year.

INSECTS INJURING THE APPLE.

In dealing with our fruit insects we will commence with those affecting the apple, as being our most important fruit tree, and begin with the root, going up the trunk and so to the leaves and fruit. Affecting the root, the only insect I know as especially injurious to the root of the apple-tree is the root plant louse or *Eriosoma pyri*, which belongs to the family *Aphidæ*. It attacks the roots under ground, and deposits its eggs upon them, wounding the surface and causing an irritation which results in the formation of galls or protuberances of various sizes, in which the young insects lodge and feed (*see Fig. 66*).

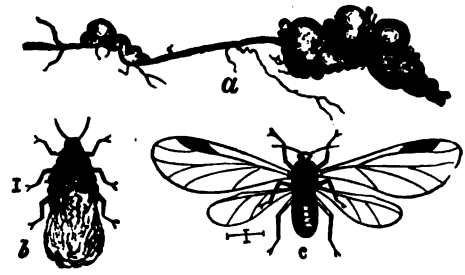


Fig. 66.

In *Fig 66 a* represents the galls, a specimen of the work of this insect, *b* and *c* the perfect winged insects magnified; the hair lines at the sides give the correct size.

Very serious injury is done by these attacks, and frequently young trees are so badly affected that they become quite useless, and have to be dug up and destroyed. The presence of the insect may be suspected from the unhealthiness of the tree, but it can only be actually discovered by laying bare and examining the roots. It is very seldom that one sees a lot of young trees exposed for sale which are not more or less affected by this pest. The only artificial remedy which has been suggested is to uncover the roots of the tree as much as possible, and pour scalding water upon them, thus destroying the insects. This, however, is a tedious and troublesome remedy and one not very often used. The insect is preyed upon by a species of *Syrphus* fly, *Pipiza radicum*, which lays its eggs on the roots, and the larvæ which are hatched-out feed freely upon the lice. (*Fig 67*).

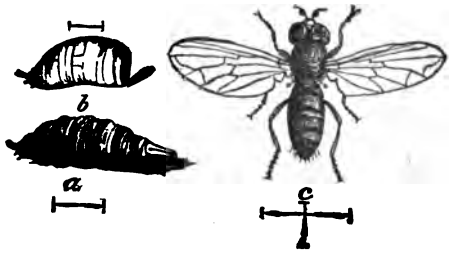


Fig. 67.

Fig. 67 shows this fly with its larva (*a*) and chrysalis (*b*), all magnified.

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INJURING THE TRUNK.

Going upwards to the trunk of the tree, we find that there are two borers, which affect it seriously.

THE STRIPED BORER.

The one is known as the striped borer, *Saperda Candida* (*Fig. 68*), and the other as the

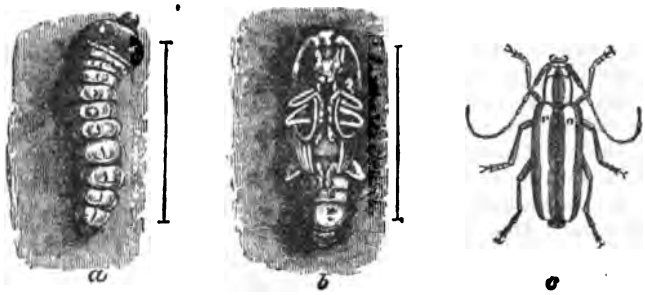

Fig. 68.

Fig. 68—a the larva or grub, *b* the chrysalis, and *c* the perfect beetle.

Buprestis apple-tree borer, *Chrysobothris femorata* (*see Fig. 69*). The former is a very

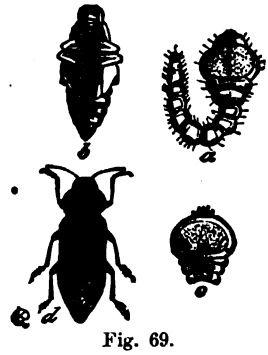

Fig. 69.

Fig. 69, a shows the larva, *b* the chrysalis and *d* the perfect insect.

beautiful insect, of a deep brownish colour, with creamy white stripes. It is fortunately not very common in Ontario. Having received specimens from Montreal, and having found it myself at London, I should say, however, that I believe it is scattered over the whole country, and I know it is moderately common at Niagara and St. Catharines.

Rev. Mr. BETHUNE stated that it had never, to his knowledge, been found along the north shore of Lake Ontario.

THE BUPRESTIS BORER.

Mr. SAUNDERS.—The other borer, the *Buprestis*, is unfortunately very abundant throughout the Province. The one species may be distinguished from the other by the difference in form, both in the larval and perfect state. The Buprestis beetle is much smaller than the other, and of that coppery metallic hue which Mr. Bethune has described as peculiar to the family of *Buprestidæ*. The larva of the striped borer is nearly cylindrical, with a large brown head and strong jaws, while that of the Buprestis resembles a tadpole in form, the anterior segments of the body being much enlarged, and the hinder

ones correspondingly small. The habits of the two species are very similar. The parent insects deposit their eggs on the bark of the tree, the striped borer generally about the collar, or base of the trunk, and the Buprestis sometimes there, but sometimes higher up on the trunk, or even above the first branches. The eggs are soon hatched, and the young larvæ bore in as far as the sapwood, and live there until they grow large enough and strong enough to bore into the harder wood of the trunk.

REMEDIES.

Their presence may be detected by the smooth, somewhat shrivelled appearance of the bark of the tree over the spot where they are at work, or by the castings of the wood which the larva throws out as it increases in size. If on thrusting the point of a knife into the collar or base of the tree a cavity is found, that fact will indicate the presence of a larva, which should at once be searched out and destroyed. Another remedy, a preventive measure, is the application of an alkaline solution made by mixing a gallon of soft soap with about half a gallon of water in which has been dissolved as much washing soda as it will take up. This is applied to the trunk of the tree from the base upwards to the forks and about the larger branches. The liquid, which will be about the consistence of paint, should be applied with an ordinary paint brush on a fine day, when the heat of the sun will dry the solution readily, and during the early part of June before the time when the insects deposit their eggs. This treatment will coat the tree with a sort of alkaline varnish not easily affected by rain, and seems to exempt it from attack to a great extent. I have had some 5,000 trees under my care for eight or nine years, and I have rarely found a borer in any of them under this treatment.

The Buprestis deposits its eggs earlier in the season than the Saperda, but both lay them during the months of June or July, and the solution should be applied during the first week in June and repeated, if necessary from the wetness of the weather, in the beginning of July. Generally speaking, however, one application will be found sufficient. I think the same treatment would preserve our maple shade trees from the attacks of the maple tree borer, *Clytus speciosus* (see Fig. 46). Besides keeping off the borers, this solution destroys the eggs of the *Aphidae*, and various other insects, and in fact prevents the tree from becoming a hiding place for insects of any kind, at any rate for some weeks after it is applied. They seem to object very decidedly to the alkali contained in the solution. I think we cannot urge too strongly upon our orchardists the use of a remedy so inexpensive and attended with so little trouble. These are all the borers specially injurious to the apple tree.

AFFECTING THE BARK.

The worst insect we have affecting the bark of the tree is the oyster-shell bark louse, *Aspidiotus conchiformis*, which is a very minute creature and a very troublesome one. The form in which we generally detect it is in the shape of a small scale, somewhat resembling an oyster shell, which if lifted up in August or September, will disclose a large number of minute eggs underneath. These eggs remain protected under this scale during the winter, and early in the following summer, as soon as the weather gets warm —sometimes in the latter part of May, sometimes a few days later—the young are hatched out. They wait for a warm day before leaving their shelter, and then they scatter themselves over the twigs of the tree, and when they find a suitable spot they fix themselves upon the tender growing bark, insert their beaks and become permanently located, never moving afterwards. They go on sucking the juices of the tree until towards the latter end of August or September, when they attain their full size, and gradually form this scaly shell, within which the eggs are deposited, and the female louse subsequently shrivels up and dies. *(Fig. 70.)*

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REMEDIES.

It can easily be seen that the insects are most vulnerable to attack at the stage when the young larvæ are spreading over the twigs, and before they become permanently lo-

Fig. 70.

Fig. 70 represents a small piece of the bark of an apple tree twig covered with these scales.

cated. They are then soft, delicate creatures, and if syringed with an alkaline solution such as I have described, but weaker, or a wash made of whale oil soap, a very large proportion of them will be destroyed. Again, the larger branches can be partially cleaned during the winter months by scraping, or scrubbing them with a stiff brush, and using a little alkaline solution. I have never tried crude petroleum as a remedy, for the reason that I have known many instances where it killed, not only the insects, but the trees as well. I have heard many people speak highly of a weak solution of petroleum, say a tablespoonful in a pail of water, but I do not think it likely to be as good a remedy as an alkaline solution, besides we know this latter to be quite harmless. While in Manitoulin Island lately, I found this insect also attacking red and white currant bushes, but as a rule it confines itself to the apple.

There is another species which attacks the bark of the tree, *Aspidiotus harrisii*, and which is found in the United States, but not, so far as I know, in Canada. It is known from the other by the difference in the shape of the scale, and the reddish colour of the eggs, which in the common form are white.

INJURING THE TWIGS.

The apple-tree plant louse, or *Aphis mali*, which attacks the terminal growing shoots, is very similar in its habits to the plant-lice already referred to by Mr. Bethune. It fastens itself on the young, growing twigs, and sucks the juices from them, and in this way retards the growth very much. The treatment that has been suggested for the hop aphis and some other varieties of *Aphidæ* is equally applicable to this species. Syringing with an alkaline solution, or with tobacco water, proves very effectual, and the insects when washed off have no means of regaining their position, even if not killed, and consequently die.

AFFECTING THE LEAVES.

There are a large number of caterpillars which feed on the foliage of the apple tree.

THE TENT CATERPILLAR.

The tent caterpillar, *Clisiocampa americana*, is, perhaps, the most widely known of all. This insect is the progeny of a moth of a brownish colour, with lighter stripes, which appears on the wing in the month of July, and deposits clusters of its eggs upon the small twigs of trees, chiefly apple trees. A single cluster of these eggs will contain several hundreds, and these are covered with a glutinous coating, which serves as a varnish to protect the egg-mass from the action of the weather. In this state the eggs remain during the winter, hatching out in the following spring, just about the time when the buds burst on the trees. The larvæ at once begin to spin their web in which they enclose themselves for protection against the weather, and from which they issue at certain times in the day to feed on the expanding foliage. As they increase in size they enlarge their web until it presents the appearance so familiar to every one, that of a large silken enclosure containing, perhaps, two or three hundred worms or larvæ, from an inch to an inch and a half or three-quarters in length. They have the peculiar habit of all going out together to feed at certain times in the day. (*Fig. 71.*)

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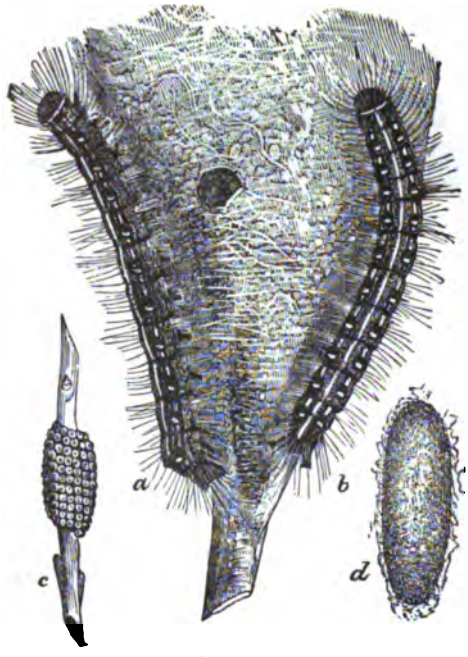

Fig. 71.

In *Fig. 71* we have a representation of these caterpillars at *a* and *b* resting on a portion of the web; *d* is the cocoon which contains the insect in the chrysalis state, and *c* one of the egg masses.

THE FOREST TENT-CATERPILLAR.

There is another closely allied species, called the forest tent-caterpillar, *Clisiocampa sylvatica (Fig. 72)*, which for four or five years was very destructive in the neighbourhood of London, but which has now almost entirely disappeared. It constructs a sort of web on the sides of the trunks or large branches of trees, but not of the same kind as the common tent-caterpillar.

Fig. 72.

Fig. 72 shows the larva of this species, which differs from *americana* in having a row of spots down the back instead of a continuous stripe, and in several other minor points.

This species does not confine its attention to fruit trees, although it seems to prefer them, but attacks also the leaves of forest trees. Some three years ago, the forest trees in the neighbourhood of London were almost entirely defoliated, so abundant was this pest.

REMEDIES, NATURAL AND ARTIFICIAL.

I reared a large number of these caterpillars with a view of ascertaining what prospects there were of any diminution in their numbers, and, with the same object, examined the stomachs of a great many

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BIRDS.

I found in the stomach of one bird only—the cuckoo, or *Coccygeus americanus*—a very large quantity of these larvæ, in fact, the crop was packed full of them. This was the only instance I ever knew in which these larvæ were devoured by birds. In rearing them, however, I found that a very large number, after the first year, produced

PARASITIC INSECTS;

one species of Tachina, and two species of ichneumons, being very abundant. I have have no doubt that these parasites did more towards destroying the caterpillars than any other cause. A disease of a fungoid character also broke out amongst them two years ago, which doubtless had a good effect also in thinning their ranks. I have known the *americana* to be destroyed by

FROSTS

coming on just after they had hatched and before they had spun web enough to protect them from the cold. Besides the parasites I have named, I have found a small mite, a species of *Trombidium*, which feeds upon the egg-mass during the winter, and consumes the contents of the eggs, leaving nothing but the shells of those which it attacks. These are all the natural remedies I am aware of, but the tent caterpillar is easily controlled by

ARTIFICIAL MEANS.

I would advise the cutting off and destroying of the egg-clusters during the winter, when they can be readily seen, and an inspection of the trees in the spring, to see that none have escaped. In case any of the pests have survived till then, they will have begun to construct their web, and can be easily removed by cutting off the twig on which they rest, or if high up on the tree, by a pole with a cloth twisted round the end of it. If proper care is exercised, this caterpillar need never be destructive in any orchard. But with the forest tent caterpillar the case is very different. It feeds upon the leaves of so many different trees that it has a much wider area in which to breed, and whenever it is abundant, it is enormously so. In my own orchard, in which there are about 5,000 trees, I was obliged for two years to keep two men constantly employed, for five or six weeks each season, in killing these caterpillars, in order to preserve it from destruction. From the smaller trees the caterpillars may be removed by jarring, but, being extremely active, they soon take up their position on the tree again, if not at once despatched. In thinking over the matter it occurred to me that as each of the fleshy pro-legs of the caterpillar is furnished with a fringe of hooks, it would be a difficult thing for it to crawl over a material like cotton batting, so I tied strips of that substance, some three or four inches wide, around the lower part of the trunk of the trees, tight in the centre, so that the upper part of the strips would overhang the middle somewhat, and watched the result. I found that the larvæ would crawl up the tree until they reached this band, and then they would go round and round, until they apparently became tired and went down again. In a letter to one of our local papers I mentioned the matter, and the plan was extensively tried, and it seemed to work very well indeed, almost entirely preventing the caterpillar from climbing up the trees. I consider this species where abundant as more destructive to the apple than all other caterpillars put together.

THE TUSSOCK MOTH.

Another destructive insect is the white-marked tussock moth, or *Orgyia leucostigma*, the egg masses of which are found in the winter time glued to a dead leaf, and this fastened to a twig of the tree. These egg-masses produce in the spring clusters of small

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caterpillars, which, as they grow older, become very handsome. They are prettily tufted with long black pencils of hair, two in front and one behind, and are ornamented with yellow brush-like tufts between the two extremities and small coral-red knobs or warts. (*Fig. 73.*)

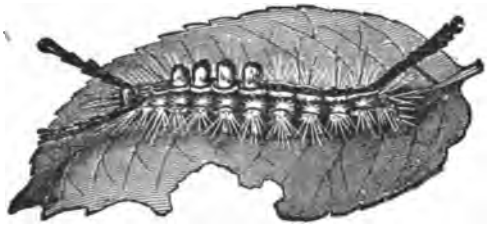

Fig. 73.

In *Fig. 73* we have a nice representation of this larva.

The females of this insect have no wings, and look very much like large spiders. They await the attendance of the males at the foot of the tree, where they have emerged from the chrysalis, and then crawl up the trunk and deposit their eggs in the manner described. Jarring the trees causes the larvæ to spin a web and drop to the ground, where they can be gathered up and destroyed.

THE YELLOW-NECKED CATERPILLAR.

Another species is the yellow-necked caterpillar, or *Datana ministra*, and similar in habits, though different in appearance, is the red-humped caterpillar, *Notodonta concinna*. The egg-clusters of both species are deposited by the moths on the twigs of the trees, and both larvæ feed in large societies. They do not remove from the branch on which they are placed until they have consumed all the foliage upon it, when they extend to neighbouring branches, and defoliate them in like manner. The thoroughness of their work leads to their ready detection, and the best remedy is to remove the clusters and destroy them. There is no great difficulty in keeping either of these species in check.

THE FALL WEB-WORM.

The Fall Web-worm, *Hyphantria textor*, begins its operations in the fall, when the orchardist thinks he is at length free from trouble with tent caterpillars. Its egg-clusters are found adhering to twigs in a similar manner to that already described, and when the larvæ are hatched they also spin a web, though not such a large one as that of the American tent-caterpillar. The larvæ, too, are slenderer and smaller, usually not more than an inch or an inch and a quarter in length, and are of a yellowish or greenish colour with clusters of white hairs all over their bodies, arising from small black and orange yellow protuberances arranged in regular rows across the body. They may be readily removed by hand. Other trees are subject to their attacks besides the apple, in fact I have found them upon nearly every kind of tree. They will also attack the currant and blackberry. I have never noticed them on the grape vine.

CANKER WORMS.

There are two species of canker worms which, until late years, have been confounded with each other. One species produces a moth late in autumn, and the other partly in autumn, but chiefly in the following spring. There are perceptible differences in their larval and moth characteristics which are sufficient to establish them as distinct, but as their habits are precisely similar we can speak of the two species as one. The fall species probably attracts more

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attention than the other. After severe weather, when it might have been expected that almost all insect life would be destroyed, especially anything so delicate in structure as these moths are, they may be met with in the woods flying about in all directions. They seem, in fact, to require a great amount of cold to fully develope them. The females of both species are without wings, the male only possessing powers of flight. The female is very much like the female *Orgyia*, being a spider-like creature, with six long legs, and a large body thickly clothed with scales. She is very unattractive in appearance, while the male is a very beautiful insect indeed. After copulation the female climbs up the tree, and deposits her eggs, usually on the twigs. The larvæ are hatched out in the spring, and quite early in the summer attain their growth. Their method of walking is by "looping" their bodies, viz., by drawing the hinder feet close to the fore feet, again extending the latter, and so on. They are prettily striped with yellow and brown. After attaining its full growth—late in June, or early in July—the insect descends to the earth and forms a chrysalis which remains undeveloped until the advent of the cold season, when the moth breaks through and escapes to perpetuate its species. (*Figs. 74-77.*) This insect

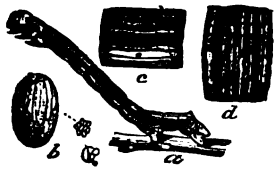

Fig. 74.

Fig. 75.

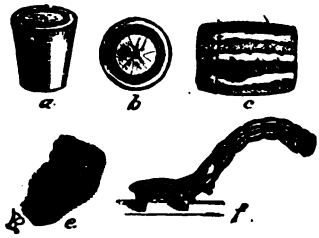

Fig. 76.

Fig. 77.

Fig. 74 shows the larva and egg and *Fig. 75* the moths, male and female, of *vernata*, the spring form; while *Figs. 76* and *77* represent similar stages of the autumn insect.

has been very troublesome in many parts of the United States, attacking not only the apple tree but several varieties of shade trees, particularly the elm.

REMEDIES.

Various means have been resorted to to prevent the female from climbing up the trees and depositing her eggs. Strips of tin or zinc have been fastened about the tree, about three inches wide and sloping downwards, like an inverted funnel, so that the insect could not surmount them, also bandages of cotton and other fabrics, daubed with tar, have been used with the same end in view, and by these means the trees have, in many instances, been saved from serious damage. I have not had much opportunity of judging whether the English sparrow has had any effect in reducing the number of these insects, but I am of opinion that it has not.

THE CECROPIA EMPEROR CATERPILLAR.

The Cecropia emperor caterpillar, *Samia cecropia*, the largest and one of the most handsome moths we have, also feeds upon the leaves of the apple tree. It is a very beauti-

ful creature, and measures, when its wings are opened, from five to seven inches across, has brown and yellowish markings, with prominent kidney-shaped spots on the wings. The moth (*see Fig. 78*) appears during the month of June, and deposits her eggs singly on the

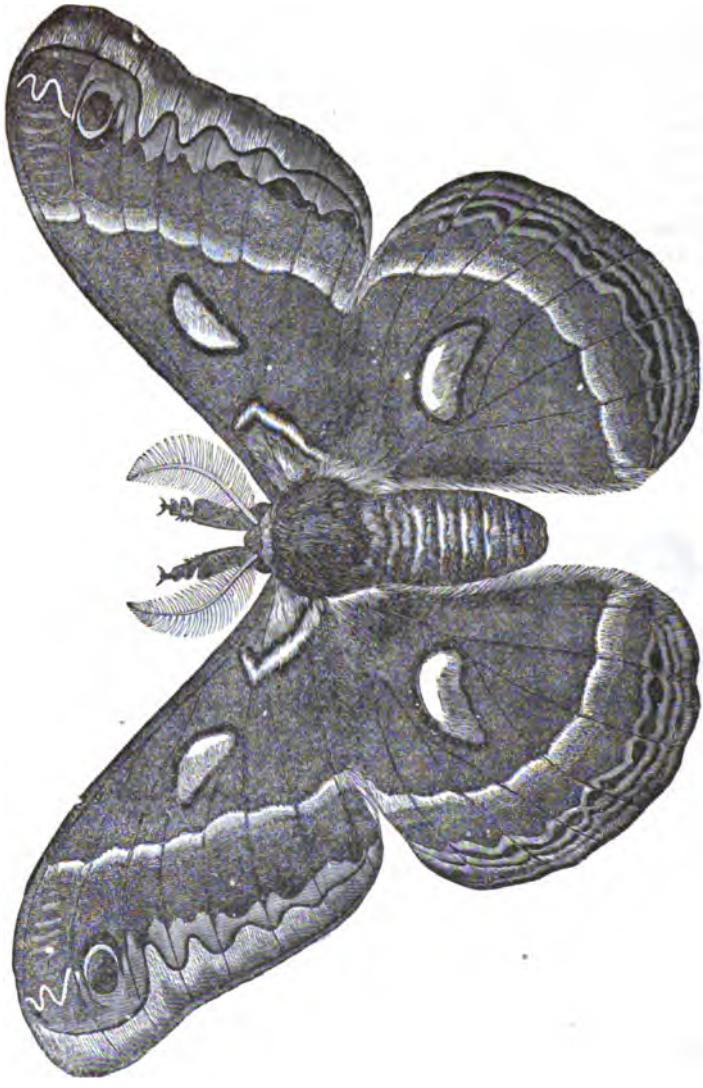

Fig. 78.

apple-trees. These, during the next five or six weeks, hatch into caterpillars, which finally grow to be three or four inches long, and about as thick as a man's finger or a little thicker. They are green in colour, and are covered with warts; those on the top of the anterior segments are large, and of a coral red colour, the remainder are yellow, excepting those on the second and hinder segments, which, in common with the smaller ones along the sides, are blue (*see Fig. 79*). Early in the autumn the larva spins its strong silken cocoon, perhaps three inches in length, inside of which it changes to a chrysalis and re-

[*Mr. W. Saunders.*]

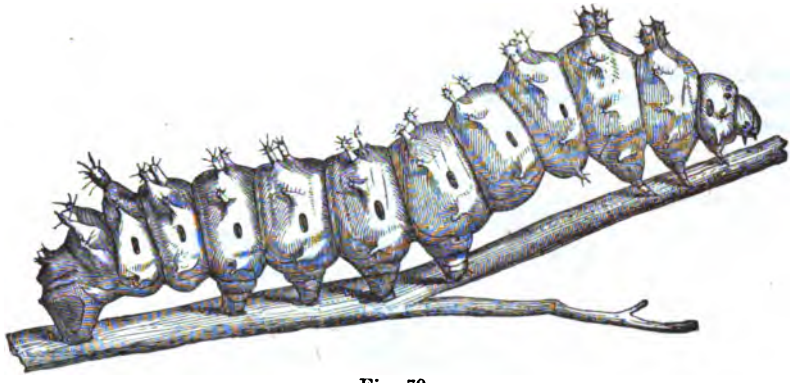

Fig. 79.

mains during the winter (*see Fig. 80*), developing the moth the following season, about the beginning of June.

Fig. 80.

REMEDIES.

A large number of parasites feed upon the *cecropia*, and it is quite common to find that out of a number of cocoons from which you are expecting moths, the larger proportion produce nothing but ichneumons. In this way I presume the insect is kept very much in check, and it is very seldom present in sufficient numbers to defoliate a tree unless the tree is young. I have, however, seen the branches of young trees quite bare from the ravages of this caterpillar. It attacks a great variety of trees. I have found it on the European alder. It is common on the plum, and sometimes seen on currant and lilac bushes; in fact it is a very general feeder, though usually preferring the apple.

RASCAL LEAF CRUMPLER.

Another insect feeding on the leaves of the apple tree is the rascal leaf crumpler, or *Phycita nebulo*. It has a curious habit of constructing rather a dead-looking case, not unlike a horn in shape, in which it passes the winter in the caterpillar state, and from which it makes its exit in the spring, using the case as a place of retreat, travelling out in search of food, and returning to it when it has eaten sufficient to satisfy itself. This caterpillar gnaws the bark of the twigs early in the spring, and sometimes in this way very seriously retards the year's growth of the tree. I do not know of any artificial remedy other than hand-picking. I have bred an ichneumon fly from them which seems to be quite common, and which, I have no doubt, keeps them in check. These are all the insects I can now think of as being particularly injurious to the leaves of the apple trees.

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THE CODLING WORM.

There is an insect which feeds upon the fruit, with which we are all acquainted, viz., the codling worm, *Carpocapsa pomonella.* (*Fig. 81.*) It is a European importation, and a pest which causes the loss of many thousand dollars' worth of fruit every year. The moth is on the

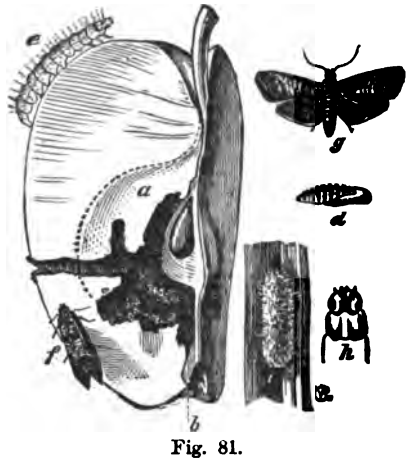

Fig. 81.

In *Fig. 81, f* and *g* represent the moth with the wings closed and expanded, *e* the larva, and *d* the chrysalis.

wing quite early in the season, about the time the apple trees are in blossom, and as soon as the fruit is formed, or almost before it is formed, the insect deposits her eggs in the upper end of the apple blossom. These eggs are soon hatched into young larvæ, which penetrate into the growing fruit, and mature there when the fruit is about half grown. At that time we notice a great many apples fall from the trees. These are brought down from the effect of the presence of the larvæ. The irritation set up in the fruit by them, brings on premature ripeness, and consequent falling from the tree. This half grown fruit is, of course, useless for any purpose, but the fact of its falling to the ground sometimes has a beneficial effect upon the remainder of the crop, which thereupon receives a greater proportion of the juices of the tree, and thus has a better chance of reaching full size before maturity. The larva sometimes leaves the fruit before it falls, and crawls down the tree looking for a sheltered spot in which to spin its cocoon. Sometimes it falls to the earth with the apple, and in this case it generally ascends the trunk of the tree in search of a proper hiding place in which to go into chrysalis. This habit the larva has in seeking for a sheltered place, in which to spend the inactive stage of its existence, has suggested a very useful remedy for counteracting its ravages.

REMEDIES.

By tying, about the middle of the trunk, a bandage of old cotton, cloth, or even paper, a suitable hiding place is presented to the larvæ, which at once makes use of it by entering in and going into chrysalis there. If the bandage is applied to a tree on which there is a good crop of fruit, and tied in the middle, I have found, as a rule, that there will be as many or even more larvæ above the string than below, showing that a large proportion of them leave the fruit before it drops, and crawl down the tree. The insect remains, during the summer months, about ten or twelve days or sometimes a fortnight in the chrysalis state, and the bandages ought to be examined once a week so as to make sure that none escape. In this way a very large number of pupæ may be collected, and the trees preserved, in a great measure, from the visitation of a second brood, which otherwise would be shortly hatched.

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THE SECOND BROOD.

If allowed their own way, in about two weeks the chrysalids mature, and the moths escape to deposit the eggs for the second brood. These are sometimes placed on the calyx end of the fruit, and sometimes on the side, the larva is hatched and eats its way into the centre of the apple. The process of growth, however, does not seem to be so rapid in the second as in the first brood, and the larvæ sometimes do not attain maturity until quite late in the fall. Frequently the apples, especially winter varieties, are pulled with the larvæ inside, and in this case the insects come to maturity during the winter, and spin their cocoons about the barrel, the bin, or wherever the apples happen to be.

FURTHER REMEDIES.

The insect is always double-brooded. It is very desirable that the fallen fruit should be picked up and disposed of at once in order to get rid of that proportion of the insects which may come to the ground with it. This, however, is only a partial remedy, and I regard the bandage system as the most successful means that can be employed to check the pest. I think if it were generally practised in any locality for a single season, the insect would be so far destroyed that the crop of the following year would be almost entirely free from the worms. It might not be wholly free, because the moths are able to fly for some distance, and they might come from neighbouring orchards, but as a rule they pay their first attentions to the orchard in which they generate, and remain there as long as they find sufficient food. This is a very important insect indeed, and one which we cannot be too careful about.

AVOID SHIPPING WORMY FRUIT.

In shipping apples to England, if a barrel is opened and one or two wormy ones are found on the top, the whole barrel is depreciated in price, if not altogether condemned. The wormy specimens can generally be detected by the hole which the larva has made, but this is sometimes situated in the eye of the apple, in such a way as to escape notice unless a very close examination is made.

PARASITES.

I have bred one or two parasites from the codling worm, but it does not seem so subject to the attacks of parasites as some other species are. I do not know how these parasites could be encouraged. I have only found them in two or three instances, showing that they are not at all numerous, and that we cannot, as yet, look to them as likely to afford us much relief from the pest. The worm exists in England, as well as here, but not to the same extent. Apples are not so generally grown there as here, and it may be too that they have a parasite with which we are not acquainted.

INSECTS INJURING THE PEAR TREE.

Passing to the pear tree, there is just one insect to which I would like to call attention, and that is THE PEAR TREE SLUG, *Selandria cerasi*, which also occurs on the cherry

Fig. 82.

Fig. 82 represents this slug at *a* full grown, and also in a younger state feeding on the leaf; *b* represents the perfect fly.

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and the plum. *(See Fig. 82.)* It is a disgusting, slimy little creature, with the anterior segments enlarged, presenting an appearance something like a tadpole, and is accompanied by a very unpleasant odour. It seems to prefer the tissues of the leaf, eating them all away and leaving the skeleton framework only. I have had it very injurious to my own pear trees, so much so, indeed, that on several occasions the foliage was almost entirely destroyed, and the trees presented a scorched look, as if fire had passed over them. With this destruction of the foliage, of course, the fruit did not reach its proper maturity or flavour, and the trees were very seriously injured. It sometimes prevails over a considerable area of country, and some seasons I have known it to be very abundant.

REMEDIES.

It is frequently stated by agriculturists, and in our fruit journals, that it is extremely easy to get rid of this insect by throwing up sand or ashes into the tree, and these sticking to the slimy body of the insect destroy it. I have not found this remedy so efficient as it is said to be. In fact, I have on one or two occasions experimented with the larvæ, covering them with sand, and have found that they shed their slimy skin two or three times in succession without any further effect being produced on them. I have not tried lime, which is sometimes recommended, because I have found a very efficient remedy in hellebore. A tablespoonful of hellebore in a pailful of water and applied with a syringe or watering pot destroys them all in a very few moments. The insect is fitful in its appearance, and you may cultivate the trees sometimes for years without seeing it. It is the progeny of a four-winged fly, of a blackish colour, with transparent wings, which is abroad early in the summer. The insect spends the winter in the chrysalis state in the ground, and the flies emerge early in the season, laying their eggs, which hatch out into the slugs, on the pear, cherry, or plum. From what I have seen of the insect, I believe it to be double-brooded, but I am not quite sure. I have never found any parasites feeding upon it. Many of the insects I spoke of as feeding upon the apple will feed equally upon the pear, but this particular insect does not appear to attack the apple at all.

INJURING THE PLUM TREE.

Going now to the plum tree, I might also remark that many of the insects which feed upon the apple and pear devour as well the leaves of the plum; but there are several species which particularly affect the latter. One of the chief is

THE PLUM SPHINX,

(*Sphinx drupiferarum*), a large green caterpillar, with white stripes on the sides, and a prominent horn at the tail (*see Fig. 83*). It attains the length, at maturity, of perhaps

Fig. 83.

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three or three and a half inches, and is correspondingly thick. This produces a very handsome sphinx moth (*see Fig. 84*), which is a night-flying insect, and has a flight some-

Fig. 84.

what similar to that of the humming bird. It deposits its eggs about the month of June, and the larva attains its maturity about the end of autumn, when it descends from the tree, enters the ground and changes to a chrysalis (*see Fig. 85*), in which form it remains until the following season.

Fig. 85.

THE POLYPHEMUS CATERPILLAR

(*Telea polyphemus*) is the progeny of another of the emperor moths, and is also occasionally found on the plum. It is one of our handsomest insects. The larva is about as thick as a man's thumb (*see Fig. 86*), of a greenish-yellow colour, and with the segments of the body very deeply cut into. These segments are crowned with tubercles which have clusters of small spines proceeding from them. Its history is very similar to that of the sphinx which I have just mentioned. Instead, however, of forming a chrysalis under ground it spins a cocoon inside of two or three leaves of the tree on which it is feeding,

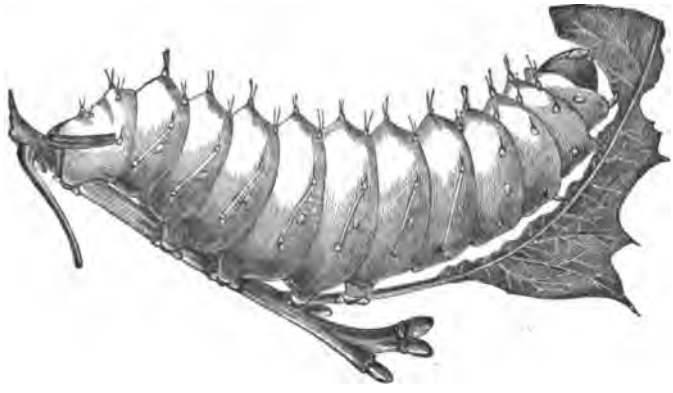

Fig. 86.

[*Mr. W. Saunders.*]

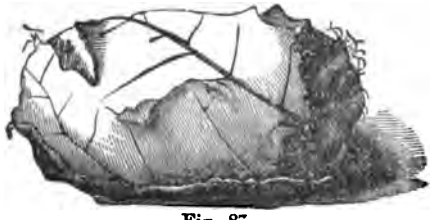

Fig. 87.

which it draws together, and within this enclosure changes to the pupa state. This cocoon (*see Fig. 87,*) being attached to the foliage, falls to the ground with the leaves in the autumn, remaining there until the following summer, when, in the early days of June, the large handsome moth is produced (*see Fig. 88*).

There are two other insects, very much smaller, which are injurious to the plum. One is the

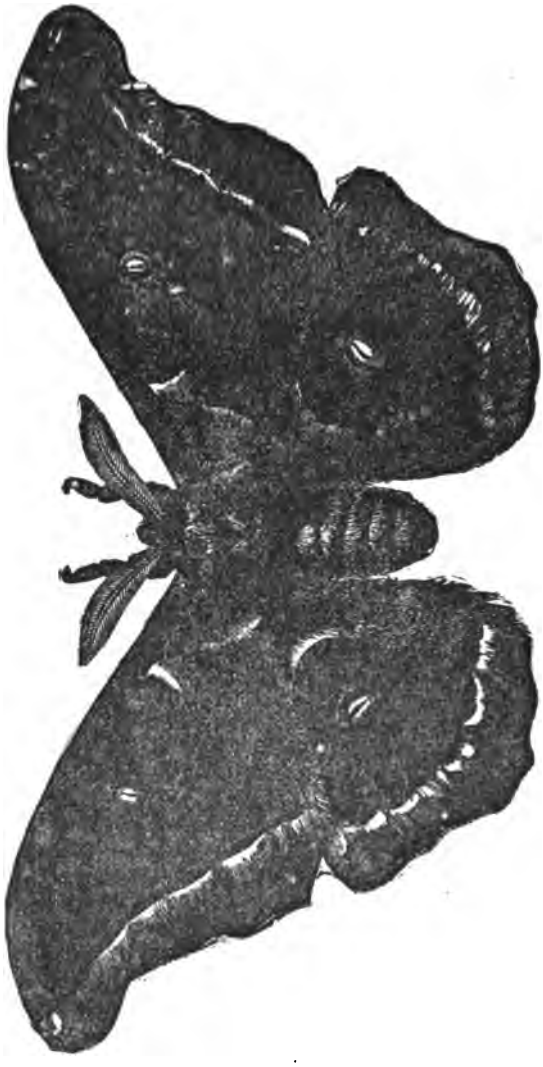

Fig. 88

EYE-SPOTTED BUD MOTH.

(*Graphiolitha oculana*), the larvæ of which is very minute, not more, I should say, than three-eighths of an inch in length, bluish in colour, and with a black head (*see Fig. 89*).

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Fig. 89.

It has the habit of spinning a few silken threads, around the young leaves, or expanding buds of the plum tree, and eating into the leaves or young fruit. It affects the pear as well as the plum, and is sometimes found on the apple. Although small, yet attacking, as it does, the fruit in its infancy, it is capable when numerous of inflicting a great deal of damage on the crop. The insect, after feeding for two or three weeks, passes into the chrysalis state, and produces a very pretty little moth, which again deposits its eggs in time to produce larvæ the same season. I am of the impression that these larvæ generally pass the winter in an undeveloped state, from the fact that they are sometimes found half grown very early in the spring. It may be that they occasionally attain the moth state in the previous autumn, and hybernate in a torpid condition, as many other insects do. *Fig. 89* represents this tiny insect in both the larval and perfect forms.

THE OBLIQUE-BANDED LEAF ROLLER.

The other moth is the oblique-banded leaf roller, or *Loxotaenia rosaceana*, which is not by any means confined to the plum, though perhaps preferring it to any other tree. The larvæ (*see Fig. 90*) is of a green colour, with a brown head, and is very active. It draws together two or three leaves and feeds on the interior, or on the surrounding leaves. It goes into chrysalis within these leaves and produces a brown moth (*see Fig. 91*), with an oblique band of a darker colour across the wings, from which it derives its name. As it appears very early in the season, while the foliage is very young, the damage it does is quite disproportionate to its size. One often sees the skin of young fruit eaten off almost entirely by these larvæ, and they frequently puncture the stems of the fruit at this period, causing it to decay and drop off. They are found on a great many other trees besides the plum, and are occasionally seen on the gooseberry, the currant, and the strawberry. The only remedy is hand-picking, or syringing the trees with some poisonous substance, such as hellebore, which destroys them. There are several parasites which prey on them abundantly, so that they are usually kept within reasonable bounds.

Fig. 90.

Fig. 91.

CURCULIO.

The only other insect which attacks the plum is the well-known curculio (*Conotrachelus nenuphar*), whose ravages are directed against the fruit. It belongs to the Curculionidæ, the same family as that to which the pea-bug belongs, and is not unlike that insect (*see Fig. 92*). It is small in size, and of a rough gray or blackish colour, and when resting looks very much like a dried bud of the tree.

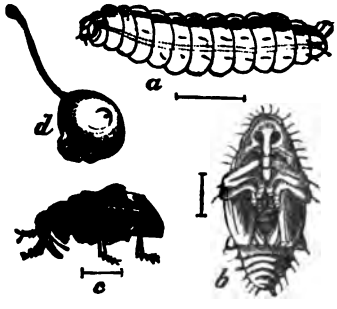

Fig. 92.

In *Fig. 92 c* represents the beetle, *a* the larva and *b* the chrysalis, all magnified; *d* shows the insect in its natural size, at work on a young fruit.

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METHOD OF CATCHING.

It has the habit, in common with most other curculios, of dropping to the ground and feigning death when suddenly alarmed, and advantage may be taken of this habit to destroy the insect. Having spread a sheet beneath the tree, the latter can be jarred, when the curculios will fall to the ground, feigning death, and may then be gathered up and destroyed.

ITS LIFE HISTORY.

Its life-history may be given in a few words. It usually passes the winter in the ground, in the chrysalis state, though the perfect insect sometimes escapes from the chrysalis, during the later autumn months, and then may be found under the bark of trees, hybernating in the winter. As soon as the trees are in blossom the curculios may be found in abundance upon them, waiting for the first signs of development in the young fruit. Before the blossoms have fairly left the tree, the tender fruit is detected by this watchful pest, which at once begins to deposit eggs in it. These shortly hatch into small grubs, which penetrate into the fruit, causing decay and premature falling. The jarring ought to be begun early in the year, while the trees are in blossom, and in this way a large proportion of the curculios may be collected before they have done any mischief; in fact too much stress cannot be laid upon the recommendation to begin the jarring process quite early in the season.

THE "RANSOM CHIP METHOD"

consists in simply placing a number of chips under the tree with a view to providing a hiding place for the curculio, and afterwards examining the chips from time to time and destroying the curculios. I have tried it several times, but have never yet found a curculio under the chips. It was supposed that the curculio would take refuge beneath the chips in its passage from the earth to the tree, and also when, from any cause, it had been dislodged. The method was first promulgated by Mr. Ransom, a large fruit grower in Michigan, who claimed to have achieved very satisfactory results by it, and who, it would appear, was able in this way to collect large numbers of the insects. For some reason or other, however, it has not been successful with me.

Rev. Mr. BETHUNE stated that he had obtained curculios by the chip method, though not in anything like the numbers Mr. Ransom was said to have done.

Mr. SAUNDERS.—No doubt curculios may be caught in that way, but I think it would be a mistake to rely upon it as a sufficient remedy. There is a peculiarity in the habits of this insect which is not generally known or understood. Most insects seem to have their periods of rest, when they abstain from eating and working, but the curculio appears to be almost always on the move—that is, during warm weather.

ACTIVE AT NIGHT.

I have found them to be quite common on the trees at night, and by enclosing specimens in boxes, covered with black cloth so that no light could get in, have found them to deposit eggs notwithstanding the darkness. They are active during the day, and seem to be almost as active at night. Their periods of inactivity, if they have any, seem to be about the cool of the morning or early in the evening. I do not know whether they keep hard at work during the entire season, but presume that, if the weather were cold, they would remain torpid during a portion of the day or night. I consider the jarring method quite sufficient as a remedy to keep the insect in check, when faithfully followed.

DISTRIBUTION OF THE INSECT.

The curculio is spread over a very large portion of the Province. A favoured section which formerly extended from near Goderich to Collingwood, but which has been narrowed down to that portion of the country extending from some point between Kincardine and Owen Sound to Collingwood, is still free from it, but I don't think it will be many years

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before the curculio takes possession of the remaining territory. Last year it was found quite common at Kincardine, and from that district, where we once obtained thousands of bushels of plums, we now obtain scarcely any, so destructive have been the ravages of the insect. So disgusted, indeed, have the plum-growers there become with the difficulties they had to encounter in their endeavours to keep it in check that many of them have given up the attempt in despair, and allowed the insect to have almost undisputed sway. The jarring process, however, is so effectual, and involves so little expense, that, although the price of plums may be a little higher, I do not think we need ever fear a dearth of plums from this cause. The jarring is not continued, generally, for more than three or four weeks, if begun in time, though it depends a good deal upon the season. After repeating the process a number of times, you will find that you do not get more than perhaps two or three curculios from a good many trees, and it is then not worth while continuing it any longer.

PARASITES.

Two parasites have been bred from the curculio, but they have not, so far as I know, been found in Canada, and only to a limited extent in the Western States. Prof. Riley has bred and described them; they are very small ichneumons. If we could get them it would be very desirable to import them, but they are so scarce in the States where the curculio is very abundant, and they appear to spread so slowly and to such a limited extent, that I do not think we have much to hope for from them. The habits of the insect seem to protect it from the attacks of parasites, it being generally imbedded in the fruit while in the larval form, and in its chrysalis state hidden underground.

OTHER REMEDIES.

Other measures have been recommended, for instance, paving the ground under the trees with stone, or smoothing it and covering it with a coating of plaster or lime, so as to prevent the curculios, which fall with the stung fruit, from entering the ground. If they begin to travel about, they meet with many enemies, such as chickens, carnivorous insects, etc., and are liable to destruction.

GATHERING UP THE FALLEN FRUIT.

Gathering up the fallen fruit is also a very important part in any plan to get rid of the pest. The fruit should be gathered almost every day, so as to insure collecting the larva along with it, and it should then be burned, fed to hogs, or otherwise disposed of; but above all things, it should not be buried, as that would be accommodating the larvæ very much indeed, by placing it in that position most favourable for its preservation.

BURNING COAL TAR UNDER THE TREES.

Burning coal tar under the trees and allowing the smoke to ascend through the branches seems to be a remedy of considerable value. Should a shower of rain occur shortly after the smoking process has been completed, it will have to be repeated in a day or two; the troublesome and disagreeable nature of the remedy seem to make it one less to be commended than the jarring system, which is more simple and quite as effectual.

BOTTLES OF SWEET LIQUID.

It has also been recommended to suspend vessels containing a sweet liquid in the trees with a view to attracting the curculios and drowning them, but I do not attach much importance to this method. I have also heard parties claim that good results have arisen from the introduction of elder branches among the limbs of the tree, but I would not like to endorse this plan either, as I have never tried it, though it is a well-known fact that some forms of vegetation, which have a strong odour, are obnoxious to certain insects. Wherever wild plum trees exist, they afford a good breeding-ground for the curculio, and should be attended to with as much care as the cultivated trees. In fact, it is my experience that the wild varieties are very much worse affected by the insect than the cultivated sorts.

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AFFECTING THE PEACH.

The only insect of importance attacking the peach tree is the peach borer, *Ægeria exitiosa* (*see Fig. 93*). This is a wasp-like insect, with transparent wings, and a richly

Fig. 93.
In *Fig. 93*, *1* shows the female insect, and *2* the male.

ornamented body, banded and striped with gold, which deposits its eggs about the base of the trunk. The eggs hatch out, and the larvæ bore into the sapwood, and cause an exudation of gummy matter which appears in masses about the base of the tree. The larvæ seem partly to live in this gummy substance and partly in the sapwood of the tree. Sometimes three or four are found on the same tree, occasionally girdling and destroying it, but always inducing more or less of a diseased condition, and impairing its vigour. Altogether it is a very objectionable and destructive insect.

REMEDIES.

It is usual on the appearance of these gummy masses to cut them away, trace out the larvæ and destroy it. By watchfulness in this way its depredations may be stopped. It has been suggested that banking up the trees with earth would prevent the insects from depositing their eggs, and the method is very strongly recommended by those who have tried it. As a rule those who look after their peach trees closely have not much trouble with the borer. It is easily discovered by this gummy exudation, and can be easily taken out and destroyed if it is looked after at the proper season.

The Commission resumed at 7.30 p.m., when Mr. Saunders continued his evidence as follows:—

INJURIOUS TO THE GRAPE VINE.

The green grape vine Sphinx *(Choerocampa pampinatrix,)* is one of the commonest insects which devour the foliage of the grape, and when abundant, it almost entirely strips the vines of their foliage. It is a large green caterpillar *(See figure 94)*, striped at the

Fig. 94.

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sides with whitish stripes, and it has a horn at the tail. It is very voracious indeed, consuming a very large quantity of vegetable food. It is easily detected from the amount of work it performs in this direction. We find the leaves of the vines rapidly disappearing, and naturally inquire the cause, and detect the presence of this pest from its castings on the ground. Hand-picking is a very ready means of getting rid of this larva.

PARASITES.

There is one species of ichneumon fly which is very destructive to this caterpillar. The fly deposits a large number of eggs in the larva, and when the larva has attained about two thirds of its growth it manifests a sickly appearance, and from the inside of its body these parasitic grubs begin to emerge, eating their way through the skin, and spinning their cocoons through the upper side of the caterpillar, giving it a rather peculiar appearance, as shown in figure 95, so that it has sometimes been taken for a new variety. The larvæ afterwards sicken and die. In this way a considerable number in each year are destroyed. This ichneumon fly is universally found with the worm, and is a very efficient check.

Fig 95.

Fig. 96.

The moth is a very handsome creature (*see Fig 96*), the fore wings of an olive green colour, crossed by bands of greenish grey; the hind wings are of a dull reddish hue.

THE WOOD NYMPHS.

There are two small moths, which in the larval state are injurious to the grape—very beautiful insects. One is called the beautiful wood nymph, (*Eudryas grata*), *see Fig. 97*, and the other the pearl wood nymph, (*Eudryas unio*), *see Fig.* 98. These moths are nearly

Fig. 97.

Fig. 98.

alike. In both the ground colour is creamy white, and the rest a rich brown shading. They are active only at night. During the day-time they rest on the grape vine foliage, and are often found with their wings closed, sloping like the roof of a house, and their fore-legs extended and tufted with large tufts of hair, presenting a very peculiar appearance for a lepidopterous insect. In this way they rest, not unlike a patch of the droppings of birds, and seem to obtain that exemption from foes which is desirable for their preservation. The Virginia creeper is subject to their attacks as well as the grape vine, but they rarely attack the Virginia creeper where grape vines are plentiful.

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THE LARVÆ.

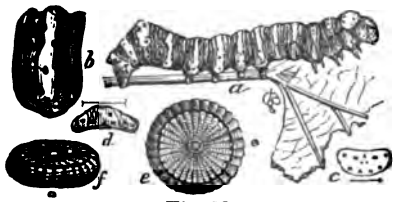

Fig. 99.

Fig. 99 represents the larva and egg of *Eudryas unio*, when full grown; it is about an inch and a half in length, and is variously covered with red, black and green markings. The larvæ cut holes through the grape vine leaves, and riddle them very severely. I am not aware that any parasite attacks them. I have never bred any from them.

GRAPE CIDARIA.

Another insect attacking the foliage, is the grape cidaria, (*Cidaria diversilineata*). This insect belongs to the family of geometers or earth measurers, from their habit of measuring the ground in walking. Their larvæ is an inch or an inch and a quarter long, and is at times very plentiful, and is then very injurious to the foliage.

THE COMMON WOOLLY BEAR,

(*Spilosoma virginica*) also attacks the grape vines very much at times, especially those grown under glass.

SMALL MOTHS.

The grape vine leaf roller (*Desmia maculalis*), (*Fig. 100*), and the grape vine plume

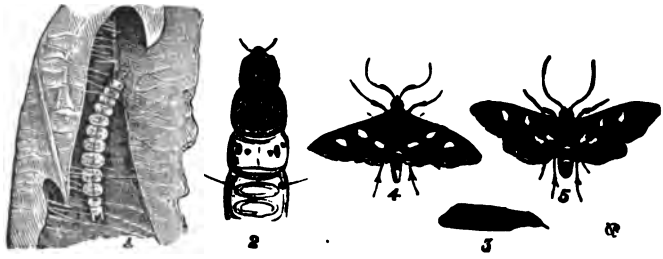

Fig. 100.
Fig. 100, shows both moth and caterpillar of this species.

Fig. 101.
Fig. 101 represents this insect in its various stages.

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moth, (*Pterophorus periscelidactylus*), (*Fig.101*), are both very handsome little moths, and are at times very injurious. The plume moth feeds on the vine very early in the season, just as the foliage is expanding, and at that time it does as much execution as a much larger species will when the foliage is more fully developed. It riddles the leaves and sometimes destroys the fruit to some extent.

THE GRAPE-VINE LEAF ROLLER.

The grape-vine leaf roller is a pretty little dark brown or black moth with two white spots on each of the hind wings. It makes a little case of the leaf by rolling and stitching it up, and it is so active that it pops out of one end of the case thus made, before you can catch it at the other. These are all the insects that seriously affect the leaves. There are some beetles, however, which attack the leaf.

REMEDIES.

The other three moths mentioned before, also feed on the leaves, and if at any time they are found to be destructive they can be easily kept in check by syringing the leaves with hellebore and water or Paris green and water. I may remark that all insects that feed on the leaves of plants may be disposed of in this way, whether they are larvæ of butterflies or moths, or whether they are beetles, the hellebore being used in the proportion of two tablespoonfuls, and Paris green in the proportion of a teaspoonful to a pailful of water. It is well to use a little hellebore and water or Paris green and water, whenever the leaves are eaten from any cause.

THE SPOTTED PELIDNOTA.

The spotted pelidnota (*Pelidnota punctata*) is a red coloured beetle spotted with black (*See figure 102*), and is the commonest beetle found on the grape vine. It devours the

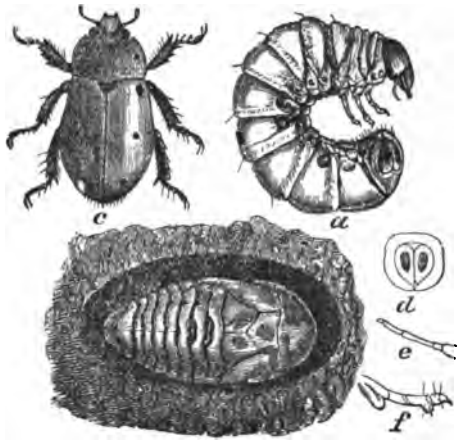

Fig. 102.

leaves only when they are mature, and seldom does any serious damage. The larva of this insect lives in rotten wood, as in the decayed stumps of trees.

THE GRAPE-VINE FLEA BEETLE

The grape-vine flea beetle (*Haltica chalybea*) is a much more destructive insect. (*See Fig. 103* where it is shown both in the larval and beetle forms). During the past season it has been greatly complained of, having almost entirely destroyed the grape crop in some localities. It attacks the vine just as the buds are swelling, and although it is a small beetle, not more than three-twentieths of an inch in length, it is rather voracious for

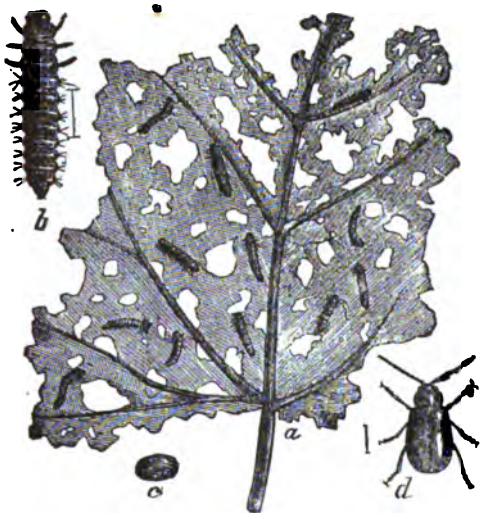

Fig. 103.

In *Fig. 103* the beetle is shown at *d*, the larvæ at *b*; *c* is the chrysalis, while *a* represents a leaf partly eaten by the worms.

its size, and it will devour a bud containing in embryo three or four bunches of grapes at one meal. In that way, if very numerous, it will sometimes destroy the greater part of a crop in three or four days; as adventitious buds seldom contain the germs of fruit to any great extent, subsequent budding will not remedy the disaster much.

ITS HISTORY.

The history of the insect may be briefly traced. The beetles that appear in early spring are those that have hybernated in the rubbish and decayed leaves at the base of the grape vines, or in their immediate neighbourhood. After they have fed a while on the expanding buds, and as soon as the leaves of the grapes begin to form, they deposit their eggs on the leaves, and in time these hatch into small, black larvæ, with six feet, which begin to feed on the foliage, riddling and devouring it very much in the early period of its growth. These larvæ are usually quite numerous, and continue feeding on the vine for some weeks. When they attain their full growth, they descend to the ground and enter the chrysalis state, where they remain till the autumn, when the beetles escape from the chrysalis and hybernate in rubbish, and among the dead leaves.

REMEDIES.

Some difficulty has been found in killing this insect. During the past year the entomologist of the Department of Agriculture, at Washington, has been conducting a series of experiments with the view of devising some expeditious means of catching and killing this insect, and the most useful plan he could suggest, after many experiments, was to thoroughly saturate a strip of cotton, three by six feet, with kerosene oil, and hold it under the vines while they are being jarred. The beetles fall by the jar, and the kerosene kills them. They are rather torpid in the early part of the day, especially in the cool of the morning, and if the vines are visited at that time, and the screen put underneath them, they can be readily shaken down, and destroyed. By keeping the neighbourhood of the vines quite clean and free from rubbish, and not affording these insects any hiding places, you can lessen their numbers very much, since unless they have a place to hybernate they are more exposed to their enemies, and will probably leave the neighbourhood and look for shelter elsewhere.

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THE ROSE BEETLE.

Fig. 104.

Another beetle, *Macrodactylus subspinosus*, commonly known as the rose beetle *(Fig. 104)* has been very destructive, in some parts of the United States, to roses, and in that way has got its common name. This season it has been very injurious to the grape in some sections of the Province. It is about half an inch in length, with long spreading legs, and of a brownish colour, and devours the leaves very rapidly. In the larval state it is found eating the succulent roots of plants and grasses. It deposits its eggs in a cavity in the earth, and when the larvæ complete their growth they enter into the chrysalis state in the ground, and the next season produce this beetle which is so destructive.

THE THRIPS.

Another injurious insect belonging to the family of bugs, *Hemiptera*, is a species of Tettigonia called the thrips. *(See fig. 105.)* The true thrip is a different insect altogether. This so called thrip is a very small insect, and there are several different species which pass under that name, differing in ornamentation. They are all furnished with beaks or

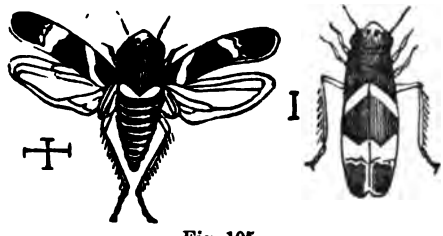

Fig. 105.

Fig. 105 shows one of the commonest forms, with wings both closed and expanded.

rostrums with which they pierce the leaves, and sucking the sap produce small white dots upon them, and when the insects are very numerous they soon affect the entire leaf, so that it withers either partially or wholly, and the vine presents a very diseased appearance, while for want of proper foliage the fruit fails to ripen as it should, and hence the crop is very much injured. The thrip is very partial to the thin leaved grapes, while the thick leaved varieties generally escape its ravages.

REMEDIES PROPOSED.

Several remedies have been suggested for it, but it seems a difficult insect to control. It multiplies very fast In the early portion of its life alkaline solutions syringed on the vines will probably destroy it, as its texture at that time is very delicate, and easily affected by alkalies. As it gets older, its wing cases become harder, and it is less likely to be injured in that way. It has been suggested to build small fires in the neighbourhood of the vines, as the thrip is attracted by light and would fly into the fire and be burned. It has also been suggested that persons might carry torches through the vineyards, the vines being jarred by an assistant while the lights are carried past. The jarring will disturb the insects in the vines, and they will naturally fly to the light and be burned. The syringing and the fire remedies are the only likely ones suggested for the thrip.

THE TREE CRICKET.

The tree cricket, *Œcanthus niveus*, attacks equally the raspberry and the grape. It belongs to the order Orthoptera. The female is furnished with a very characteristic ovi-

Fig. 106. Fig. 107.
Fig. 106 represents the female, and *Fig. 107* the male of this species.

positor for placing her eggs, (*see Fig. 106*). She has a saw-like apparatus, by means of which she is enabled to saw through the wood with ease. She sits on the cane and saws a slit large enough to contain an egg, which is placed in it. Then moving a little she saws another slit, and deposits another egg, and so on, until a straight row of eggs have been laid about an inch or an inch and a quarter in length. This series of slits in the cane weakens it very much, and during the winter those eggs deposited in that manner are preserved from change of temperature and from destruction by birds and other insects that might prey upon them. The insect does not feed upon the vine or the vine leaves, but the presence of these eggs weakens the stem mechanically to such an extent that when the foliage expands in the following season the weight of it sometimes breaks the stem, and thus the crop is lost. This same insect is very destructive to the raspberry, and very often the raspberry crop is much injured by the breaking of the canes. The young tree crickets when hatched are said to feed on the aphides, commonly known as the plant lice. I have, however, no personal experience to offer in corroboration of that statement.

THE GRAPE SEED INSECT.

There is an insect (*Isosoma vitis*), a very small fly which affects the seed of the grape. It deposits its eggs on the outside of the skin of the fruit, or just under the skin, and the egg, when hatched, produces a small larva, which finds its way through the grape seed to the kernel while the seed is in a very soft and green state. There it lives, feeding on the kernel of the seed, and by the time the grape has attained maturity the inside of the seed is almost entirely consumed by this tiny grub. The result of this operation on the seed is to prevent the ripening of the grape, either partially or wholly, so that you will often find many green grapes among the grapes that have ripened. Frequently, in a bunch of ripe grapes, there will be half a dozen or a dozen of these green berries, which is usuallly the result of the presence of this pest. There is not much more known about it, except that it is very generally disseminated. There have been no parasites bred from it that I know of.

THE HONEY BEE

(*Apis mellifica*) has been accused of injuring the grape crop, and, I believe, with a good deal of justice. During this past season, in the neighbourhood of St. Catharines, several parties have lost almost their entire crop from this pest. Mr. Rykert, who has been one of the sufferers, tells me that he has watched and seen them attack the sound grapes, bite through the skin and proceed to extract the juice. The only way in which he could save his grapes, was to cover them with netting. Mr. Taylor, of St. Catharines, who is a large grape grower, has also complained much of this trouble.

CURRANT AND GOOSEBERRY PESTS.

The principal enemy of the gooseberry is

THE IMPORTED SAW FLY

(*Nematus ventricosus*). It was introduced many years ago, appearing first, I think, in the State of New York, and it has gradually spread, until now we find it almost everywhere throughout the Northern United States and Canada. The parent insect is a small trans-

parent winged fly, about the size of the ordinary house-fly, but furnished with four wings (*see Fig. 108*). This fly makes its appearance very early in the season, and as the young

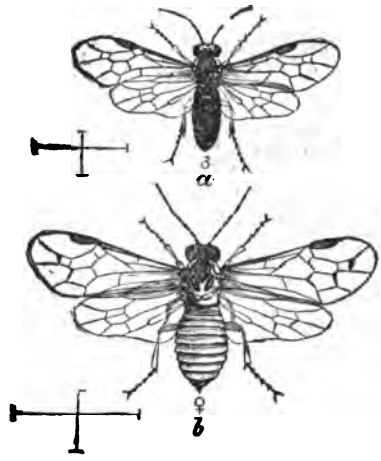

Fig. 108.

In *Fig. 108* we have represented both male and female flies—*a* the male, *b* the female.

foliage is expanding, deposits its eggs, usually along the ribs of the leaves of the gooseberry, in regular rows, on the under side (*see Fig. 109*). The eggs are set end to end,

Fig. 109.

and are fastened by some glutinous substance. In a few days these eggs hatch out little grubs, which proceed to eat holes in the leaves. On turning the leaves up you will find the young colony of larvæ very numerous, and you can sometimes destroy the whole brood by picking two or three of the leaves and trampling them under foot. If not checked at that time, they soon scatter over the bush, and you find the foliage disappearing with great rapidity, first from the lower portion of the bush, and from that upwards, until in a very brief space the whole of the foliage of the bush, or nearly the whole of it, may be

[*Mr. W. Saunders.*]

Fig. 110.

Fig. 110 represents the larvæ, nearly full grown, feeding upon the leaves.

destroyed, leaving the branches bare (*Fig. 110* shows the larva at work). The insect is at least

DOUBLE-BROODED,

and it is sometimes supposed to have more than two broods. If it is only double-brooded, the broods appear at different periods, so that you can almost at any time during the season find larvæ on the bushes in different stages of development. You will find the larvæ most abundant in the early part of the season, devouring the foliage as soon as it is thoroughly developed, and, when full grown, going to the surface of the ground, where they construct their cocoons among rubbish or decaying leaves, coming out early in the summer and depositing their eggs for a later brood.

REMEDIES.

This pest is very easily disposed of by the use of hellebore, in the proportion of two tablespoonfuls to a pail of water. This, sprinkled on the leaves with a watering pot, will destroy them in a few moments. You have to keep constant watch in the early part of the season, and, whenever the insects are seen on the bushes, repeat the remedy.

THE NATIVE SAW FLY

(*Pristiphora grossulariæ*) is very similar in appearance to the imported one. The larvæ of the imported species is spotted, whereas the native is without spots, and is somewhat smaller in size. The native species, very probably, is attacked by some parasite, because it has never multiplied to an extent sufficient to make it a pest; whereas, the imported insect, so far as I have been able to learn, is without any parasite in our section of country.

PARASITES.

Mr. Bethune, some years ago, reared a parasite from some specimens bred in his neighbourhood, which, I think, was not present in any considerable proportion, or sufficiently to have any perceptible effect in reducing the numbers of the insects. We do not seem to have imported along with it the parasites which probably infest it in Europe, and hence we have to fight it with artificial means, but these are, in this instance, so efficient that it is easy to keep the insect in check.

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There is another very destructive insect to the currant, especially the black and the red currant. I allude to

THE CURRANT GEOMETER,

or measuring worm (*Ellopia ribearia*). It has a spotted larva (*see Fig. 111*), about an inch and a quarter or an inch and a half long, when it is matured, a great feeder, and a

Fig. 111.

much more difficult insect to destroy than the saw fly. Hellebore, which will promptly destroy the saw fly, will have very little effect on the geometer. There is something very robust in its constitution, which enables it to resist the action of this poison, and it requires to be used much more strongly, and even then it will not always prove effectual. I have found that Paris green is much more effectual, but it is undesirable to use this poison after the fruit is formed. The insect appears very early, and if the bushes are sprinkled with a solution of Paris green in the early spring, before the fruit is formed, I think there is no danger attending its use. Still, if hellebore and water, used of additional strength, will answer all the purpose, I should prefer it to Paris green. This insect has a habit of dropping from the bushes when they are struck, and suspending itself by a silken thread, and then, with a stick, you can gather a number of these threads and draw the insects together and trample them under foot. Formerly this insect was not very prevalent, but within the last five years it has spread over a large portion of Ontario and the Northern United States at a rapid rate. Another larva affecting the foliage, though it is not very numerous or destructive, is

THE SPINOUS CURRANT CATERPILLAR

(*Grapta progne*). The perfect insect is a very pretty butterfly. Occasionaly we find the larvæ in sufficient numbers to injure the foliage, but not often.

THE FOUR-STRIPED PLANT BUG

(*Capsus linaris*), belonging to the order Hemiptera, is sometimes injurious to the red currant. It punctures the tops of the young shoots, and sucks the juice out, leaving a black spot where it punctures. A dozen or so of these, will, in the course of a few days,

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give the young leaves the appearance of having been burnt, and will stunt the growth of the bush. I think the only remedy for this insect is to catch it and kill it. When you jar the bush you must be quick to catch it, because it readily takes flight after its fall. Another insect which affects the gooseberry particularly, and the currant sometimes, is that known as the

GOOSEBERRY FRUIT WORM,

Pempelia grossularia. The parent is a small narrow winged gray moth, which when its wings are expanded measures nearly an inch. In *Fig. 112* we have a representation of this moth; the oval body alongside the cocoon, containing the chrysalis. It spends the winter in the chrysalis state, in the ground, and early in the spring the moth appears on the wing, having escaped from the chrysalis about the time the gooseberries are formed, and growing rapidly, this moth deposits an egg here and there on the fruit. The egg hatches, and the young larva eats its way into the fruit, and lives in the interior portion of the gooseberry, and in a very short time the berry it feeds upon becomes discoloured, and having partially consumed it, the insect takes to another, and finally it draws together, with silken webs, a cluster of three or four berries, living in one as a sort of home, from which it issues to feed on the berries about it When it attains a growth of about three quarters of an inch, it descends to the ground, enters into the chrysalis state, and remains there until the following spring, when the moth issues to enter upon its destructive mission. There is only one brood of this insect during the year, but it is getting very destructive, sometimes destroying as much as twenty-five or thirty per cent. of the gooseberry crop in some sections.

Fig. 112.

REMEDIES.

By jarring the bushes you can collect this larva in the same way as you can the gooseberry geometer. It drops to the ground, retaining its hold on the bush by means of a silken thread, by which it climbs again when the danger is past. By drawing the threads together with a stick, you can sometimes readily collect a number of specimens of the larva. I have found that by sprinkling the bushes with air-slacked lime, about the time that the moths appear, they can be kept almost entirely free from the attacks of this insect. Where the lime is used the eggs do not seem to be deposited on the berries, as insects have a great aversion to this substance. But such a remedy does not destroy the insect; it only drives it somewhere else. There are two species of borers which attack the stems of the currant particularly.

THE IMPORTED CURRANT BORER

(*Aegeria tipuliformis*) is a small wasplike moth, with transparent wings, and a body banded with gold (*see Fig. 113*). It flies about very actively in the middle of the day, when the sun is shining brightly. After pairing the female deposits her eggs upon the twigs, generally one at the base of a bud; when this is hatched, the young grub bores into the bark of the stem to the centre, and works up and down, devouring the substance of the stem, and finally when it attains its full growth, eating a hole almost entirely through the currant stem, leaving only about the thickness of tissue paper of the bark unbroken; and inside of this opening it forms a chrysalis, with the head of the chrysalis pointing to the thin layer of bark. When the chrysalis is about to change, it has only to break through this thin layer of bark, and escape. The other species,

Fig. 113.

THE AMERICAN CURRANT BORER

Psenocerus supernotatus) has similar habits, although it belongs to an entirely different

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Fig. 114

family—the family of long-horned beetles (*see Fig. 114*). It deposits its eggs in the same manner as the Aegeria; the larvæ go through all their changes within the stem of the bush, and finally emerge in the perfect beetle form by eating their way through the stem. The remedy for these two pests is to remove, at the end of the season and during the winter, all those stems which manifest any symptom of being injured, and burn them. In that way you destroy the chrysalids, and thus lessen the danger of their increase.

RASPBERRY PESTS.

There are not many insects affecting the raspberry. There is one that affects the cane very similar to that last spoken of as attacking the currant and the gooseberry. It is a beetle belonging to the same family as the American currant borer, and is called the raspberry cane-borer, *Oberea tripunctata*. It is a cylindrical beetle about five-eights of an inch in length, of a dark colour, and with a pale yellowish thorax, with three spots on the thorax, and with long horns. When attacking the raspberry it selects the tip of the growing cane, and, biting with its jaws, makes a series of punctures around the young growth, giving it the appearance of having a ring around it. Then beginning above, it makes a second ring about an inch from the first, and between these two rings it deposits an egg in the substance of the cane. The result is that the tip of the cane withers in a few days. The object in thus biting the cane is supposed to be to lessen the flow of sap towards the parts, as the sap might possibly injure the egg embedded in the substance of the cane. The egg hatches, and the larva as soon as hatched proceeds to eat down into the centre of the cane, and spends its larval period in consuming the interior, completing its transformation within the cane—changing to a chrysalis—and finally the next spring eating its way out of the cane, a perfect beetle.

REMEDIES.

The remedy for this is very obvious. The withered tips of the canes are very easily detected with the eye, and by going among the raspberry bushes and breaking off the cane down to the second ring which the insect makes, you are sure of carrying the egg away with you, and thus you prevent the insect spreading. The tree cricket, which I have already mentioned when speaking of the grape-vine, affects the raspberry as well. There is a green saw-fly, *Selandria rubi*, which attacks the raspberry, and is a very troublesome insect. When full grown it is about three-quarters of an inch long, and is covered with small hair like spines, arising from small green tubercles. It is the progeny of a small, black, transparent-winged fly, somewhat similar to the gooseberry saw-fly, but smaller. It has a strange saw-like apparatus at the posterior end of its body, by means of which it saws little slits into the substance of the leaf of the raspberry, and places its egg under the surface. There it swells, and finally produces a small larva, which makes its exit to the outer surface of the leaf, and feeds on the substance, avoiding the veins or ribs of the leaf, and thus skeletonizes it. It is so near the colour of the raspberry leaf that it is very difficult of detection, and it requires a practised eye to find it, but you can see the effect of its work very speedily.

HOW TO KILL IT.

By the use of a little hellebore you can readily destroy it. But if they are allowed their free course, they will very soon destroy an entire patch of raspberries. There is also a small geometer, *Aplodes rubivora*, that attacks the raspberry fruit. It is a very pretty green moth which I have never found to be very common, although I have been informed that in some sections it does a considerable amount of injury. (*See Fig. 115.*)

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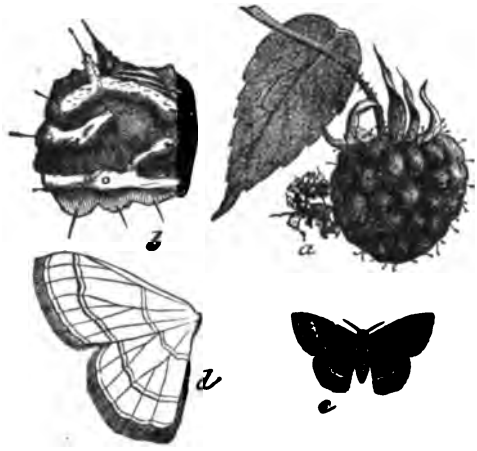

Fig. 115.

In *Fig. 115* we have the curious larva of this insect shown feeding on the fruit; *b* represents the side of one of the rings or segments of the caterpillar's body much magnified; *c* the moth of a natural size, and *d* one pair of the wings magnified.

INSECTS INJURING THE STRAWBERRY.

There are a few insects that affect the strawberry. One of these is the crown borer, *Anarsia lineatella.* It is the larva of a small moth which deposits its eggs on the crown of the strawberry, which, when hatched, produces a larva which eats its way in various directions through the crown of the plant, and in a short time so injures it that it is almost useless. In past seasons, Mr. Luke Bishop, near St. Thomas, and Mr. Chas. Arnold, of Paris, have both suffered from it very seriously. It is an insect worth noting, because it may become very widely disseminated, and if it established itself in any of the large strawberry centres, it would become a very serious evil. Lime strewed among the strawberry vines has been suggested as a remedy, but I very much doubt whether we can find any remedy which will be effectual other than digging up the affected vines and burning them.

THE WHITE GRUB—*Lachnosterna quercina.*

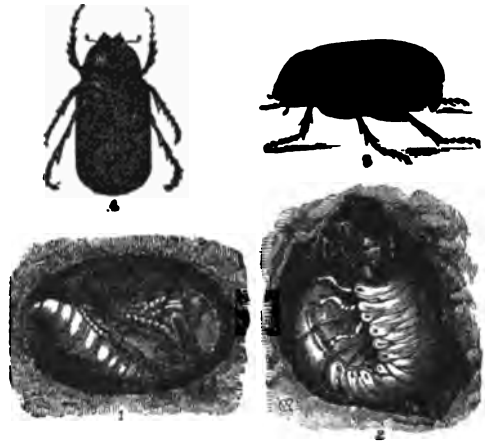

Fig. 116.

In *Fig. 116*, *2* represents the larvæ, *1* the chrysalis, and *3* and *4* the mature insect

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The larva of our common May beetle is very destructive. It feeds on the roots of plants and grasses, and seems to be very partial to the strawberry roots. A few of these insects will work great destruction in a few days; the plants wither, and you see no reason for it until you dig in the ground and find this grub at work. It frequently attacks other plants as well as the strawberry, and sometimes eats the tubers of the potato. It will eat almost anything in the way of a root or tuber, whether small or large, and one specimen is capable of devouring a great deal of food in a year. (*See Fig. 116.*) In its perfect state it is a leaf-eating beetle, and congregates on the leaves of the cherry and other trees, but during the day-time it is torpid, and if the trees are then well shaken the beetles fall to the ground, when they can be collected and destroyed. We have never had them so excessively abundant as to be obliged to resort to any means of this sort. There are two or three small lepidopterous insects, leaf-rollers, which attack the strawberry. One is very common—the *Anchylopera fragaria*. It is a beautiful little insect, but sometimes quite destructive. It gathers together the leaves and, folding them, feeds on their substance. It can easily be kept in check with the use of a little hellebore and water. There is a saw-fly also, called

THE STRAWBERRY FALSE WORM—*Emphytus maculatus*,

which destroys the leaves during the month of June. The larva approaches maturity about that time and eats holes in the leaves. This insect can also be controlled by the use of hellebore. There is a strawberry bug—*Corimelaena*—a small black insect that looks very much like a beetle, with a shining surface. I have had no personal experience with it, and I merely mention it as one of the insects which occasionally injure the strawberry. On the whole, I consider the strawberry less troubled with insect enemies than any other fruit we cultivate.

INJURING THE CUCUMBER, MELON AND SQUASH.

The cucumber, the melon and the squash are allied with respect to their insect enemies. There is a lepidopterous insect, the *Ægeria cucurbitæ*, commonly known as the squash vine-borer, which is sometimes very destructive to the squash. In its perfect state this moth is harmless. It is a small wasp-like creature (*see Fig. 117*) which deposits its eggs on the stalks of the squash vine near their base. The larva (*see Fig. 118*) eats a channel up and down the stem, consuming its substance so completely as to destroy the vine in a short time, and having attained full growth within the squash stem, finally changes to a chrysalis, and the moth emerges from the chrysalis during the summer.

Fig. 117.

Fig. 118.

THE STRIPED CUCUMBER BEETLE.

A much more common and destructive insect is the striped cucumber beetle, *Diabrotia vittata*, which feeds in the perfect state, as well as in the larval condition, on cucumber, squash, and melon vines. In the perfect state the beetle devours the young leaves as they begin to expand, and attacks them so early that one insect will often destroy an entire plant. Then it lays its eggs in the same part of the plant that I have referred to as the home of the eggs of the Ægeria, near the base. The larvæ hatched from these eggs penetrate the stem in the same way and live on the substance of the stem, destroying the vines also. This is a very destructive insect, because it feeds on the plants, both in its perfect state and its larval condition, and is a much more abundant insect. It is very difficult indeed to preserve melon, squash, or cucumber vines where this pest is abundant. The only safe method of doing so is to make small boxes with gauze tops, and place these over the young plants. This prevents the access of the beetles. I have had a great deal

[*Mr. W. Saunders.*]

of trouble with these insects during the past two years, and have tried various applications without any success whatever, and I find that this system of enclosing the young plants until they get sufficiently strong to resist the attacks of the beetle, is the only satisfactory method.

THE SQUASH BUG.

Fig. 119.

The squash bug, *Coreis tristis* (*see Fig. 119*), is another insect very destructive to the several varieties of the squash. It belongs to the order hemiptera, the true bug family, and has a very unpleasant odour when handled. This creature injures the vines by puncturing them and sucking the sap, and it lays its eggs in considerable quantities on the under side of the leaves. These hatch, and the colony of squash bugs which result will pass from leaf to leaf, and very soon the vine becomes sadly disfigured, and the foliage so injured as to prevent its normal growth, and an attack from this bug will often result in a partial or complete loss of the crop if the insect is allowed to proceed unchecked. From the fact of the insect living altogether by suction, it cannot be reached by hellebore or Paris green or other poisons of that class. It may, however, be affected by syringing the vine with alkaline solutions, and it has occasionally been subdued to a certain extent by pouring hot water on the vines, which will usually dislodge the insects, and if hot enough, destroy them.

THE CUCUMBER FLEA-BEETLE.

Another small insect, the cucumber flea-beetle, *Haltica cucumeris*, sometimes injures the cucumber, but it scarcely ever appears in sufficient numbers to warrant more than a passing notice. These are all the insects affecting the cucumber and melon which I have found to be injurious to any considerable extent.

THE BEE-MOTH.

Passing now from insects affecting fruit, I would like to refer to the bee-moth, *Gallerea cereana*, as a moth injurious to bees. It is a lepidopterous insect, and when expanded will measure about an inch across, with a notch at the end of each of the fore wings—a gray moth, with no very decided colour, (*see Fig. 120*). It is double-brooded,

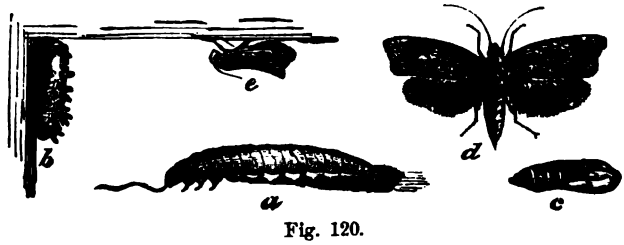


Fig. 120.

In *Fig. 120* we have the insect represented in the moth state at *d* and *e*; *a* shows the caterpillar, and *c* the chrysalis.

and the female deposits her eggs in crevices about the hives, and these eggs, when they hatch, produce small grubs, which are very active, and commence at once to work their way into the comb in the hive. The larva devours the wax, making channels through it, and destroys the young bees it meets with on the way, and it so injures the comb that when the larvæ are prevalent in the hive the bees are very apt to get disheartened with their work, and the result is a very much smaller quantity of honey and a dilapidated and diseased condition of the hive. The moth is active only at night, depositing its eggs then, and that being the period of rest for the bees, it has of course ample opportunities for pursuing its avocation unnoticed. During the day-time the moths are apt to rest about in

little crevices under the hives, and on that account the use of movable frames is recommended, so that the hives can be examined from time to time, and any lurking moths killed. The larva, when full grown, is about an inch or an inch and a quarter long. It frequently pushes its castings out at the end of the channel which it has eaten through the wax, and the outputting of these castings indicates its presence, so that by a little watching any difficulty which would otherwise be experienced from the presence of this pest can be readily overcome. That is the only insect affecting bees that I have had any experience with.

BOOKS ON ENTOMOLOGY.

There are no hand-books on Entomological matters which will compare with the hand-books on Botany, and those of some of the kindred departments of Natural History. The field in Entomology is so wide that it is almost impossible to cover the ground with a single book, as is done in the other sciences. The best practical work, perhaps, which has ever been written on the subject is "Harris' insects injurious to vegetation in Massachusetts." It is, in one sense, a scientific work, and treats first of the classification of insects, but only to such an extent as to enable the reader to understand what he is reading about. The remainder of the book is descriptive of the various pests to agriculture. The book is of a very popular character, is well written, classic in its language, and its descriptions are concise and easily understood. It has excellent illustrations, and is, I believe, the best work extant to be placed in the hands of a beginner.

THE REPORTS OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO

contain a vast deal more information than is contained in Harris' or any other one book; because they cover a much wider field, and are the result of the gleanings from other works, added to the experience of the writers themselves. I think it would be possible to reduce to the limits of a hand-book the mass of information given in those reports, if they were judiciously handled, and such a volume would be exceedingly valuable to the agricultural community. I do not think that we in Ontario are any more subject to the ravages of insects than the inhabitants of the Northern United States; in fact, some of the insects that trouble them do not trouble us at all. From what I have read, I gather that in Europe they suffer from a great many insect pests, and that the public there are not, as a rule, so well informed, as to the proper methods of treating these pests, as we are in this country.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO

communicates with the public through the *Entomologist*, which is sent to the members of the Society and to the newspapers which exchange with it. We print 600 copies every month, and circulate about 450. There are about 400 members of the society. The only qualification for membership is the payment of a dollar a year, which entitles the member to the *Entomologist*, a copy of the Annual Report, and to such other Entomological supplies as the Society may have to grant, such as classified lists of the names of insects, etc. The headquarters of the Society are in London, where there is a museum and a library, and any person requiring information relating to Entomology can obtain it very readily by corresponding with the Secretary there, or by visiting the rooms, which are freely open to all desiring information. The *Entomologist* for many years was the only periodical devoted to Entomology on the Continent of America. Several American publications have started, and failed after a year or two's struggle, since it was established. At present there are two or three publications in the United States, one of which, *The American Entomologist*, is edited by Professor Riley, of Washington. There is no newspaper in Canada that deals with Entomology systematically.

THE RELATION OF BIRDS TO INSECTS.

I should like to say a few words on the subject of insectivorous birds. So far as

my experience has gone, and it has been tolerably extensive in this matter, I have become more convinced every year that we cannot depend on insectivorous birds for the subduing of any insects which injure our crops or our fruit. In proof of this I would refer to two or three examples. Take for instance the cabbage butterfly. It is an insect which is very vulnerable to attack. It is constantly on the wing during the day time, when insectivorous birds are flying about, and when they could easily catch and devour it. The larva feeds in exposed situations on cabbage leaves, where the birds could readily discover it if they wanted to do so. It is a smooth, juicy larva, such as one would fancy the birds would like to feed on; yet this insect, from the introduction of one or two specimens at Quebec, has spread until it is now abundant, over an area extending from Alabama in the south to Lake Superior in the north, and from the Atlantic ocean to several hundred miles distant in the west—an immense district over which insectivorous birds abound. The forest tent caterpillar, to which I have already referred, is at times very prevalent in Ontario, and the only bird I have ever known to devour that insect is the cuckoo. The parasitic insect which attacks the cabbage butterfly is the only means by which we can hope to control that insect. It has for many years controlled it in Europe, and it is now keeping it under in a large number of localities in this country, and this parasite is spreading so rapidly, that we hope it will shortly so far control the injurious cabbage butterfly, that it will cease to be a serious evil. Cut worms have been very abundant in the neighbourhood of London during the spring—so much so that they have devoured cabbages in enormous quantities, and consumed flowering plants, having a special fancy, apparently for pansies. They move about early in the morning, and early in the evening, and any bird that has the habit of scratching a little could scratch this larva out even in the day-time. I had a number of birds shot and their crops examined during the prevalence of this insect, and I could not find one in the crop of any bird I got; on the other hand, when I reared a number of the larvae with the view of breeding the moths, I found them so affected with parasites that I did not get a single moth, so that, although the larvæ were exceedingly abundant, the moths proceeding from them were comparatively rare, and all through the agency, not of the birds, but of the parasites. The currant worm is another instance of the spread of an insect peculiarly exposed to the attack of birds. It is to be seen about currant bushes all day long, it does not hide in any way, it is a smooth larva which you would think birds would eat, but I have not found a specimen of it in any bird's crop. This insect has spread to almost as great an extent as the cabbage butterfly, without being checked at all by insectivorous birds. There is no parasite that lessens its numbers yet to any extent, but with the use of hellebore we are able to keep it within bounds. I do not attribute the occasional abundance of insects to any diminution in the number of the birds. I am quite satisfied that we have to look to the insect world to control that part of the insect world which is destructive to our crops. If the birds, many or few, were doing this work, we should find proofs of the fact in their crops, and the smaller the number of birds the greater would be the proof, as they would have all the more to eat. The same remarks might be made with regard to the Hessian fly and the wheat midge. Swallows and other insectivorous birds may occasionally devour a few of these small midges, but we have no proof of it, and the probability is that their work in this direction has been overrated. I have referred to these few instances, because the insects I have mentioned are well known, and the fact cannot be controverted that they have largely increased even when surrounded by birds. I should be sorry to see birds unnecessarily destroyed, but I think that well known depredators should not be protected under a false plea to the injury of the fruit grower. I do not see why the robin and cherry bird should be protected any more than the jay or the butcher bird. These do not do any more harm than the robin and cherry bird do. Certainly their work is not so ever-present to the eye of the fruit grower as the work of these persistent fruit devourers.

WILLIAM SAUNDERS.

[*Mr. W. Saunders.*]

Sittings to take oral evidence held at Perth, October 12th, 1880. *Present*—Messrs. EDWARD BYRNE (Chairman), and A. H. DYMOND.

MR. JAMES DONALD'S EVIDENCE.

JAMES DONALD, of Dalhousie, County of Lanark, was called and examined.

GRASSHOPPERS—SERIOUS RAVAGES.

In our district the grasshoppers attacked the crops severely about four or five years ago. They had been numerous the year before, but did not hurt the grain crops. Four years ago they ate up everything but peas. They even ate the corn in the ear and the potato vines. The next year they were as bad. That induced people to raise rye, which got ahead of their ravages.

EFFECTS OF A WET SEASON.

The wet season at harvest time in the next year diminished them. Since then they have continued to decrease in numbers. They still do harm in the pastures. The years they were most troublesome were very dry years. The plentiful supply of grass crops is always a protection to the grain against their attacks.

THE DESTRUCTION OF CROPS.

Of 24 acres of hay that should have given 1½ tons to the acre I did not get a load; and of 11 acres of oats I had none to thresh out. This was in the worst year—I think 1877. The spring wheat was also destroyed. Their ravages extended over the whole country, less or more, except in some of the good farm lands.

JAMES DONALD.

ANSWERS,

FORWARDED AT THE REQUEST OF THE COMMISSION, BY THE REV. VINCENT CLEMENTI, B.A., OF PETERBORO', TO QUESTIONS ON

INSECTIVOROUS BIRDS.

Name such birds as you have found to be insectivorous at all times.

All the fly-catchers, robins, martens, swifts, swallows, blue-birds, cat-birds, creepers, warblers, Redstarts (uncommon), wrens (uncommon). There are other birds which, not being purely insectivorous, feed their young on insects.

Do any wild birds or domestic fowl habitually feed on the potato beetle, *Doryphora 10 lineata*?

Scarcely any. I think turkeys are the best domestic fowl for that purpose, but I should prefer using Paris green, and of course excluding poultry.

Name such birds as you have found to prey on any other well-known insect pest.

Woodpeckers are most valuable on that account; the brown creeper, nuthatch, and titmouse.

[*Mr. Donald—Rev. V. Clementi.*]

What species devour insects chiefly in the perfect or winged states?

Fly-catchers, swallows, martens, swifts, whip-poor-will—night-hawk.

Do you find the robin, *Turdus migratorius*, to consume many insects, and do you think that the good it does in this way is an equivalent for the fruit it destroys?

It lives chiefly on earth worms, and such insects as burrow in the ground, and which are very injurious. This more than compensates for the loss of a few strawberries and perhaps cherries.

What insects are usually devoured by the blue-bird, *Siala Sialis?*

Various insects; spiders, but more particularly beetles.

Do any of the woodpeckers devour much fruit?

I think only the red-headed, which devours apples, pears, and cherries. Some, such as the golden-winged, red-bellied, and pileated, eat Indian corn occasionally. The golden-winged may eat cherries occasionally, but the only one really fond of fruit is the red-headed.

Does the cherry bird, *Ampelis Cedrorum*, eat any appreciable quantity of insects?

I think not. They catch some flying insects when they cannot obtain berries. They are most destructive to fruit, although they are enemies to the canker worm.

What is the usual food of the cuckoos, *Coccygus Americanus* and *Erythropthalmus?*

Caterpillars; occasionally berries; very useful birds. I believe they are fond of grasshoppers.

On what insects does the meadow-lark, *Sturnella magna*, chiefly feed?

Caterpillars, grubs, and beetles. It also feeds on grass seed.

What is the principal food of the cat-bird, *Galeoscoptes Carolinensis?*

Fruits; such as cherries, strawberries, and as it selects the best and ripest it is injurious to the fruit grower in that respect. The injury is, however, counteracted by the immense number of insects which it devours.

Does the English sparrow devour many insects, and what sorts?

It devours caterpillars and various insects.

Is the introduction of the English sparrow likely to be a benefit to our farmers and fruit growers or not?

On the whole, I think it is likely to prove the reverse of beneficial. It devours large quantities of grain; and it also drives away, where it has the chance, our native birds.

[*Rev. V. Clementi.*]

ANSWERS,

FORWARDED AT THE REQUEST OF THE COMMISSIONERS, BY JOHN H. GARNIER, M.D., OF LUCKNOW, COUNTY OF BRUCE, TO QUESTIONS ON

INSECTIVOROUS BIRDS.

Name such birds as you have found to be insectivorous at all times.

Robins, bluebirds, the finches, warblers, cuckoos, crows, all sorts of blackbirds, jays, wood-peckers, thrushes, snipes, wrens, fly-catchers and cherry birds (called cedar birds), and swallows.

Name such as you know to be insectivorous during the breeding season.

Almost every bird in Canada, with the execption of king fishers, and the larger hawks, and owls, and herons.

What sorts of insects do the birds usually devour?

Every kind. Crows are especially greedy of cut worms, spiders, grasshoppers, and the lepidopterous sorts; but they destroy myriads of coleopterous insects, and I have seen them busy at potato bugs. The crow is a most useful bird to the farmer, and one of his best friends. I never shoot a crow, and consider it a crime to do so, as they are harmless birds.

Have you known any birds to feed on the tent caterpillars, *Clisiocampa Americana* and *sylvatica*?

The Black-billed cuckoo I have seen destroy them.

Have you known any to feed on the codling worm of the apple, *Carpocapsa Pomonella*?

All sorts of woodpeckers, also the red-bellied and white-bellied nuthatches. I have seen the brown creeper do so, and the worm-eating vireo.

Do you know of any destructive to the plum curculio, *Conotrachelus nenuphar*?

I am sorry to say I shot a downy woodpecker that was on a plum tree this spring, pecking at the fruit almost before it was formed, and on opening its stomach, it was full of this curculio.

Do any wild birds or domestic fowl habitually feed on the potato beetle, *Doryphora 10 lineata*?

Crows I have watched kill them with my glass. The pea fowl devours them with great avidity, I know as a fact, as I have seen them.

Name such birds as you have found to prey on any other well-known insect pest.

The English sparrow on caterpillars, and insects generally when breeding, and on spiders when obtainable. Almost every species of bird has a favourite insect food. The golden-winged woodpecker goes for ant hills.

What birds devour the various borers in fruit and forest trees?

The woodpeckers bore for the borers, and the nuthatches destroy incalculable quantities of minute insect pests and eggs on the forest trees.

[*Dr. Garnier.*]

Are there any species known to you which devour the eggs of insects?

Nuthatches, creepers, kinglets, chickadees, downy woodpeckers and song sparrows, and red polls in winter.

What species live chiefly on insects in the larval or caterpillar state?

Crows, cuckoos and blackbirds. Sparrows of all sorts, cuckoos, red-breasted grosbeaks, and the worm-eating warblers, and all the vireos, at all times they can get them.

Do you know of any which feed on the chrysalids of insects?

All the woodpeckers. The hairy woodpecker goes for arctia cecropia on apple trees. Domestic fowls and ducks.

What species devour insects chiefly in the perfect or winged state?

Almost every bird that flies.

Do you find the robin, *Turdus migratorius*, to consume many insects, and do you think that the good it does in this way is an equivalent for the fruit it destroys?

It destroys a thousand times more insects than pays for any odd fruit it eats.

What insects are usually devoured by the blue-bird, *Sialia sialis*?

This bird destroys diptera more than any other sort, as I have watched a pair feeding their young in my garden, and they bring all sorts, as lacewings and caterpillars especially.

Do any of the woodpeckers devour much fruit?

The red headed woodpecker destroys a few cherries, but again, catches most of its prey on the wing, like the fly-catchers.

Does the cherry bird, *Ampelis cedrorum*, eat any appreciable quantity of insects?

It is truly a fly-catcher, and catches them exactly as a fly-catcher perching on any dry limb, and pursuing them in the air. It destroys a good many strawberries and cherries, but all the rest of the season destroys insects.

What is the usual food of the cuckoos, *Coccygus Americanus* and *Erythropthalmus*?

Insects, but especially caterpillars. I have seen them eat the tent caterpillars, and this year a pair of them and a yellow-breasted warbler, cleared my vines of a large number of leaf-rollers and other caterpillars in a short time. These two birds destroy more caterpillars, proportionally, than all other birds in America.

On what insects does the meadow-lark, *Sturnella magna*, chiefly feed?

When it first arrives in spring, on worms or anything it can get, and it especially destroys grasshoppers, as soon as they appear, until they leave in the fall.

What is the principal food of the cat-bird, *Galeoscoptes carolinensis*?

I do not think it destroys any fruits. Caterpillars and insects that seek shelter in shaded thickets. I have also seen it chase after insects on the wing.

What birds are the most destructive to grain?

In some localities, crows; in all localities, blackbirds of all sorts.

[*Dr. Garnier.*]

What birds are most injurious to the buds of fruit trees?

Occasionally the woodpecker, and the red-breasted grosbeak, and also the yellow bird, or American goldfinch.

Are there any which feed on the blossoms?

The Baltimore Oriole I have seen at cherry blossoms, it also eats the catkins of the beech.

Name those which you think are most destructive to fruits.

Red-headed woodpecker, *Turdus migratorius*, *Ampelis cedrorum*, but any destruction of fruit is more than repaid by insects destroyed.

Does the English sparrow devour many insects, and of what sorts?

A pair for some years have bred in my swallow house. They feed their young entirely on insects, and live on insects. I never once saw one in a wheat or oat field. It devours immense quantities of larvæ of spiders.

Is the introduction of the English sparrow likely to be a benefit to our farmers and fruit growers or not.

It certainly is for their good. It bosses the poor swallows and bluebirds, and stops with us all winter, and eats grain then for subsistence.

Extracts from Evidence on Fruit Growing in relation to Insectivorous Birds.

MR. W. D. BEADLE, St. Catherines, County of Lincoln.

The little cedar or cherry bird is the bird most destructive to the fruit (cherries). The robin takes a certain quantity, but he does not compare with the cherry bird in his depredations. The latter come in flocks of fifty or sixty, and sit down on the trees until they eat up all the fruit.

I don't think the cedar bird is protected from destruction by legislation. I am not aware that, as an insectivorous bird, it does anything to counterbalance the mischief it does to fruit. I think they feed their young on cherries or fruit of some kind. They feed freely on the berries of the red cedar, which ripen in the autumn and last all winter. Its young are usually on the wing about the time the cherry crop is gone, in the month of July. I don't think they raise more than one brood in the year. . . .

I don't know of any bird that feeds on the codling worm. I have sometimes thought that the hairy or downy woodpecker was searching after the larvæ, but I cannot be sure. The fly-catcher tribe, I presume, feed wholly on insects, but the robin does not; the blackbirds, I think, feed mostly on insects though they may eat some grain. The woodpeckers do most in the way of devouring borers. I have sometimes thought that those small birds, like the chickadee, seem to be seeking for the eggs of insects, but I have no positive evidence upon the point. The robin is sometimes very injurious to grapes; when they come in large flocks they will sometimes ruin a small vineyard. The depredations of the woodpecker are not very serious; the meadow lark feeds chiefly on insects, I think, but the cat-bird eats fruit as well as insects. We have been importing a bird which I think will yet prove to be a great pest—that is the English sparrow. I know of no bird that injures the buds of fruit trees so much as it. I think the oriole occasionally feeds on the blossoms of fruit trees. The birds most destructive to fruits are the cedar bird, the

robin and the woodpecker. I doubt if the English sparrow eats insects at all. They are always hunting for grain, and in the early spring they look for the buds of gooseberries and currants. It is possible that our climate may be too severe for them to multiply very much.

I am not very clear as to the advantages that may be derived from the existence of the birds I have named, compared with the disadvantages they entail upon the fruit grower. When we speak of insectivorous birds we must remember that they destroy not only insects which are injurious to the farmer or to the fruit grower, but also those which benefit him. There are insects which are of more benefit to us than all the birds put together. I should say that our Acts of Parliament for the protection of insectivorous birds generally and indiscriminately may be doing as much harm as good. There are no birds that I know of that confine themselves to the destruction of insects that are prejudicial. That, however, can only be ascertained by the careful examination of stomachs of many of them, and I have never made a careful examination.

M. P. C. DEMPSEY, Albany, Prince Edward Co.

THE ROBIN.

We do not destroy the robins, but we do what we can to frighten them away, and have often been sorely tempted to resort to their destruction. I never observed that the robin was of much benefit to us as an insectivorous bird. I don't think he kills enough insects to repay us for the fruit he destroys. I never observed any damage by the sparrows, but I have heard other people say that they destroyed some of the currant and gooseberry buds. On the other hand the Hon. Mr. Walbridge, who is a close observer, told me in a conversation the other day that he did not believe that the sparrows were destructive to the fruit. I have never destroyed any birds—even crows—but I find it is a good plan to fire a rifle ball within a few feet of them if they are destroying fruit. I have seen robins feeding on grubs and worms, but to a very limited extent. I believe young robins are more destructive than old ones.

I have given very little attention to the question of insectivorous birds. We have some birds that live exclusively on insects, such as the one we term the phœbe bird. The barn swallows live chiefly on small flies which they take on the wing. Then there is the king bird, which lives exclusively on insects, and sometimes visits our bee-hives and destroys the drones. I think the law with regard to insectivorous birds is generally observed in our section. I am very little posted in the good which the robin does, but I have had quite a sad experience as to the damage he does, as I have had nearly my whole crop of grapes destroyed by robins. They are about as destructive among a lot of grapes as a flock of hens would be. I do not know if the cherry bird has any redeeming qualities, but I do know that it is not nearly as destructive to our fruit as the robin. The cherry bird devours a good deal, but the robin comes and destroys half a dozen bunches in getting his fill. The robin will also puncture apples and pears. On the whole I consider the robin an injurious bird, not deserving legal protection. Sparrows are not numerous in our section of country.

MR. CHAS. ARNOLD, Paris, County of Brant.

The robins are a perfect pest. They will take anything and everything, including plums. * * * * * The robins are most destructive from the first ripening of the earliest cherry until November. They steal all the grapes and then they clear out. I have a tree of the Early May cherry, which is at this moment literally covered with cherry stones, with not a particle of flesh on them. The robins and

[*Extracts from Evidence.*]

cherry birds have cleaned it. The cherry bird is also an unmitigated nuisance. I have known the robin to eat ground worms, but I never knew him to eat the curculio or the cabbage worm, or anything of that kind. He is carefully protected by law, but in self-defence I am compelled to shoot him on my own grounds.

MR. P. E. BUCKE, CITY OF OTTAWA.

The English sparrow is very common with us, but we lost a great many by a falcon hawk which stayed all one winter in Ottawa and lived on them. In my opinion, the sparrow is insectivorous. We used to require a machine to gather the grasshoppers from the ground in front of the Parliament buildings, but when we got the sparrows they soon made the grasshoppers scarce. I have never found a sparrow eating the buds of trees, and I can say nothing against the bird. I have not found them destroying anything, but there are not a great many yet around my place; they keep about the centre of the town. I do not believe the stories about their destroying other birds. I have seen them eating grasshoppers over and over again, as well as the common earth worms. The cherry bird is destructive to raspberries and other fruits.

MR. McD. ALLAN, GODERICH, COUNTY OF HURON.

The robins are destructive, but they are not so severe upon grapes as upon cherries. They are the only birds I have noticed at the grapes.

MR. W. M. WESTLAND, RIDGETOWN, COUNTY OF KENT.

The robin has a decided appetite for fruits in general, and he devours a good many cherries. I never saw them on the trees in flocks, but the old ones take the cherries to their young. They also take the strawberry and the raspberry, though not to any extent. They devour a few grapes. On the whole the robin with us is reasonable in his ravages. I have never found them eating insects or caterpillars, but my impression is that he eats the cut worm. I think he takes other worms, but I have no evidence of it.

MR. JAS. DOUGALL, WINDSOR, COUNTY OF ESSEX.

We have a good many birds, but none of them are destructive to the apple. The Baltimore oriole and the robin are the most injurious to fruit, especially the former; the latter only consumes cherries and small fruits.

MR. W. MACKENZIE ROSS, NEAR CHATHAM, COUNTY OF KENT.

We did not get any cherries this year owing to the depredations of the robin, which I am sorry to say is protected by statute. The woodpecker also gives us trouble, but I do not know the cherry bird at all. The blackbird destroys a good many cherries, and also

devours some corn. I do not think that the robin eats any considerable number of insects during the fruit season. I think the robin has four broods in the year, and the young are as lively in going for the fruit as the old. I never saw robins eating insects, though I have seen them carrying the common earth worm after rain. I don't think they eat caterpillars. The robin is very destructive to some varieties of pears, and he is very fond of strawberries. The woodpecker feeds on larvæ, but I think he does harm by the holes he picks in the bark.

MR. J. HAGAMAN, OAKVILLE, COUNTY OF HALTON.

I never found the robin to attack grapes; we have plenty of robins around us.

MR. W. S. CHAPLIN, NEWCASTLE, COUNTY OF DURHAM.

The robin and cedar bird are very destructive to the small fruits, and the woodpecker is also troublesome.

ONTARIO AGRICULTURAL COMMISSION.

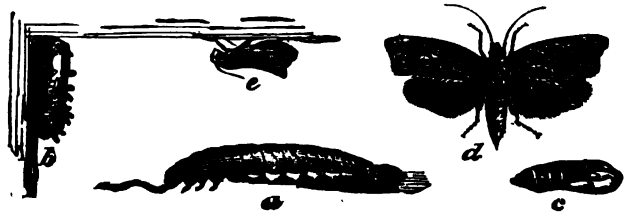
APPENDIX F.

EVIDENCE

RELATING TO

BEE FARMING.

THE BEE MOTH.



(Galleria Cereana.)

ONTARIO AGRICULTURAL COMMISSION.

APPENDIX F.

EVIDENCE

RELATING TO

BEE FARMING.

Sitting to take oral evidence, held at Toronto, June 22nd, 1880. *Present*—Mr. MALCOLM (Chairman), Hon. S. C. WOOD, and Messrs. GIBSON, DYMOND, WISER, M.P., BALLANTYNE, M.P.P., T. STOCK, W. WHITELAW, J. P. MCMILLAN, A. WILSON and E. BYRNE.

MR. D. A. JONES'S EVIDENCE.

D. A. JONES, of Beeton, county of Simcoe, was called and examined.

ITALIAN AND CYPRIAN BEES.

To Mr. Dymond.—I have been for some time engaged in bee farming. I keep from 400 to 600 stocks (colonies) of bees. I originally kept black bees. I afterwards imported Italian bees from Italy. Last winter I went to the Island of Cyprus, and imported from thence some Cyprian bees; I also went to Palestine, where I found a race of bees that I never had heard of before. The reason I went to get some Cyprian bees was this. A Count in Austria had imported two colonies from Cyprus into Bohemia, and these proved to be so far superior to the Italian bees that they created quite a sensation among bee keepers, and I visited him last winter previous to going to the Island of Cyprus in order to ascertain the real facts regarding these bees. After collecting all the information I could in Europe, I was thoroughly convinced of their superiority, and went and obtained some. During the time I was in Cyprus I had an opportunity of seeing the bees at work, and to a certain extent testing their qualities. The Italian bee is admitted to be far superior to the black bee.

HYBRID BEES.

There are no native American bees. The first bees that came to America were brought from Europe; these were the black bee—the ordinary English bee. It is frequently the case that the bees used in this country are hybrids—crosses between the blacks and the Italians. The black queens mate with the Italian drones, and the Italian queens mate with the black drones, and some have had them hybridized in order to test their qualities. The hybrid is not nearly so good as the Italian bee, but it is better than the black bee. The Italian bees are better workers and better breeders than the hybrid bees, as well as better tempered and more easily managed. The hybrids are crosser than either the black bees or the Italians.

Cyprians Early and Late Breeders.

The Cyprian bee breeds much earlier in the spring and much later in the fall than the Italian. An objection to both the Italian and the black bees has been that they cease breeding too early in the fall, and go into winter quarters with weak stocks. Bees only live from sixty to ninety days in the ordinary course; but while they are lying in a dormant state in the winter the time does not count; so that if many old bees go into winter quarters they die out in the spring, and the hive becomes so weak that the young bees die.

Longevity of Queen Bees—Climate.

The life of the queen is prolonged from two to five years, during which time she continues fruitful. I have had satisfactory proof that the Cyprian bees are superior. Count Kolowrat of Bohemia stated that when the Italian and black bees were weak and a mere handful in the spring, the Cyprians would be strong and ready to swarm before the others were thinking about being strong enough to gather honey. On the mountains in Cyprus the weather is severe, but in the valley it is mild; the bees are found both on the mountain and in the valley. Some of the bees I got were from very high up on Mount Troodos.

Wintering Bees.

I winter my bees within doors. The temperature of the bee-house I keep at 45 degrees. In winter the bees are in such a dormant state that if you open the door of a bee-house where there are 200 colonies you can hear hardly any noise. The bee-house must be kept thoroughly dark and frost proof. There are about as many bees kept in Cyprus in proportion to the population as here.

Bee Keeping in Canada.

Bee keeping has increased very much in this country since new methods have been introduced. From all I can learn with respect to other parts of the world I am thoroughly convinced that there is no place superior to Canada for bee keeping, if it has an equal. Some people think that California is better, but there they have seasons in which they get no honey at all; and taking everything into consideration, I think our country is the best. In this country we let the bees lie dormant in the winter time; but in California their time of dormancy is in the summer time, when it is hot, and from the spring to the fall, right through midsummer, they are consuming their stores until they can get honey, whereas ours gather honey all summer, and so consume very little honey. As a feeding ground for the bee, Canada possesses great advantages over any other country, partly because we have many wild flowers, and partly because we have the basswood tree, which is the greatest honey-producing tree in the world. It produces honey for from twelve to eighteen days in the month of July.

Honey Supply.

With regard to the sources of supply to the bees, the first honey they get in the spring is from the willow—of which there are about sixty varieties—and soft maple. Next come the fruit blossoms. Then follows a dearth of about ten days, during which they have only the dandelion. Then come white clover, raspberry blossoms and all the wild berries, and then basswood and Canadian thistles. I had about ten thousand pounds of honey from Canadian thistles last year. After them come all the fall flowers—an innumerable quantity of flowers that produce honey more or less. On the shores of the Mediterranean I saw a thistle that very much resembles our Canadian thistle, and which I think belongs to the same family. An average stock of bees, with good management, will produce from 100 to 800 pounds each.

[*Mr. Jones.*]

Production of Honey.

Last spring I had 800 colonies, and I increased them to 600, and I took out of them 75,000 pounds of honey. That result could be obtained by any person, with the same management, in hundreds of localities that I know of throughout the country. I am not acquainted with all the farming districts in Ontario, but what I would select as the best for bee-keeping are those where the land is not all ploughed and sowed. I would like high land and low land both within a mile or half a mile of the apiary, as high and dry land will secrete honey earier than low and wet lands.

Comb—Oriental Hives.

In the manner in which they keep bees in Palestine it is impossible for them to obtain much honey. We keep our bees in movable comb hives, and we use the honey extractor to take out the honey, and then place the combs back in the hives and let the bees refill them. We do that every five or six days when they are gathering honey, and in addition we manufacture the comb for them, in order to save them from making the comb. One pound of comb given to them saves them from 20 to 25 pounds of honey. It requires 20 or 25 pounds of honey to secrete wax enough to make a pound of comb, and while they are making that wax they loose 20 or 25 pounds more; so that I consider that we save from 40 to 50 pounds of honey by supplying them with the comb. But in Cyprus they use no improved methods. They keep their bees in clay cylinders from 30 to 32 inches in length, and from 8 to 12 inches on the inside diameter. They stop up one end of the cylinders and pile them up as we do our cordwood, and the bees have to enter at one end only. They leave these cylinders until they think they are sufficiently full of honey, and then they remove the round stone which closes them up at one end and take out the honey, driving the bees forward to the front end of the cylinder. When they take out all the honey that they think the bees can spare they stop up the cylinder again and replace it till next year. The mode of keeping bees in parts of Palestine is a little different. They are there kept in water-jugs. The jugs have long necks, and the people lay them down on their side and the bees work in and out of the jugs. About Jerusalem and through the hills of Judea the hive is made like our improved conical bullets, flat at one end and tapering at the other. The point is the front end of the hive, and the bees fly out and in at that end. About Mount Lebanon and Mount Hermon the hives are made much longer than about Jerusalem, and are plastered on the outside with clay. In Damascus, and near the desert on the east and north-east of Damascus, the bees are usually kept in clay cylinders, but not burnt cylinders like those in Cyprus. The cylinders used about Damascus are about three or four inches thick, and are dried before the bees are put into them.

Varieties of Honey.

The honey is not nearly so good as ours; it is very dark and strong; but honey differs according to the locality where it is gathered. Honey gathered on the mountains is brighter, richer in colour, and pleasanter in flavour than that gathered in the valleys. At Beyrout, at the foot of the mountain, it is very dark and strong, while five or six thousand feet up Mount Lebanon the honey is bright and of a very much finer flavour. I noticed the same fact at Jerusalem, at Mount Hermon, and in Cyprus. I think clover honey has the best flavour; it is a mild and pleasant honey, and very rich. Basswood honey has more body to it, and any person who likes more strength would probably like basswood honey the best; but it is not liked by everybody so much as the clover honey.

No Feeding in Winter.

I never feed my bees in the winter time, and anybody who does will not have any in the spring. That is where the great mistake of most people lies. They disturb their bees

[*Mr. Jones.*]

and make them gorge themselves, they cannot discharge the excrement, dysentery follows, and they soon die.

Canadian Honey.

Almost any of our honey in Canada is quite equal to the foreign honey; and the honey grown in the United States is not so fine as ours unless it is in about the same latitude. The farther south you go the darker and stronger is the honey. I do not look to a foreign market for the sale of my honey; I think we have demand enough in Canada to exceed our supply for some time to come. It readily commands fourteen or fifteen cents a pound.

Honey *versus* Wheat.

I don't think there is anything a person can engage in, in the shape of farming, so profitable as bee farming, measuring the profit with the amount invested. Twenty hives of bees, judiciously managed, will often yield as much as a field of wheat. I have stated to the farmers in my section of country, and they all admit it to be a fact, that 100 colonies of ordinary bees in one season represents a thousand dollars. Take a farmer with a farm and the implements he uses thereon worth $10,000, and let him manage his farm as well as he can, I say the profits arising from the bees, if judiciously managed, are greater than the profits from the farm. That has been proved in my section of country time and again.

Foreign Demand for Honey.

There is a demand for any amount of honey we can raise. H. K. & B. F. Thurber & Co., of London, offered to take 100,000 pounds of my honey at fair prices if I would give it to them. The pure honey sells in England at twenty-five cents a pound retail, and the comb honey from twenty-five to forty cents a pound. At present there is very little honey exported from this country to Great Britain. I exported five or six lots just to try the market, and I ascertained that there was no difficulty in selling it there. There has been honey adulterated with glucose brought from the United States to Canada. Chemists and any one who is a judge of honey can easily discover the presence of glucose. I can detect it by its taste. Another test is that glucose will not granulate, while all pure honey in this country will granulate. Sometimes it will not granulate till late in the fall or until the cold weather; at other times it will granulate in four or six weeks after it comes from the hive. But granulation is a proof of purity.

Diseases of Bees.

Dysentery among bees is brought on by mismanagement. Another disease that affects bees in this country is called foul brood, a fungus that attacks the hive and ultimately affects it so badly that it becomes depopulated. Salicylic acid is a remedy. Just as soon as this disease attacks the hives, or as soon as it is discovered, the bees should be removed from the combs, starved for forty-eight hours, and put in new hives; the combs should be then melted and hives scalded thoroughly. The system of in-breeding is very deleterious to bees.

Breeding Bees—Bee Moth.

I have to keep importing and crossing my bees constantly. I breed drones from one queen and queens from another. The queen always mates in the air. There are not many insects in this country destructive of bees except the moths. I think the greatest cause of destruction is ignorance in management. People allow the queen to die, and then the moths get into the hive, and they think the moths destroy the bees, whereas the fact is the queen dies and leaves the hive unguarded. If the queen dies and there are no eggs in the hive, the stock will be destroyed in a short time. If the queen is killed by accident or otherwise during the summer season, there are always eggs in the hive; but if she dies from any cause in the winter, and it is not discovered in the spring that she is gone, the moths will get in and destroy the bees.

[*Mr. Jones.*]

Importing Bees—Mode of Shipment.

I have left a man in Cyprus to raise bees and ship them to me, which he is now doing constantly. The price of these Cyprian bees will be very low—just barely enough to cover the cost of importing them. No price that I could possibly charge would pay me for bringing these bees over with me. I am paid from $12 to $15 for those I brought, and I received orders from New York for nearly all of them. They are valued from the reputation obtained by those which have been imported into Europe, and not merely on account of their novelty. It is a very difficult matter to import them to this country. Those colonies I bought in Palestine I had sent down to the coast, and had them forwarded by steamer to Cyprus. There they were transferred from the cylinders into movable frame hives. I then made a box about 4 x 5 x 6 inches out of pine lumber. I put a screen on the bottom and one in the top, each about three inches square, to let the air pass through. In one end of the box I fixed a bottle filled with water, and having a cork through which a cutting was made for a wick. Through this cutting I drew a cotton wick, and by capillary attraction this wick is kept wet with the water, and the bees drink and then eat some granulated sugar, which I fastened upon the other end of the box by pouring it in hot and allowing it to cool. Between the bottle and the sugar I had a comb with a little syrup in it. There was a queen and from 150 to 300 bees in this box. I had a crate made to hold twenty-seven of these boxes, and they were separated from each other by about an inch and a half, so that a current of air always passed around every box. I have some bees that were kept six weeks in that way, and during the whole time they were only flown once; that was when I arrived in London. Some of the bees appeared to need this, and others did not. The water was very bad, and I have given instructions that in future consignments the water should be boiled before being put into the bottle; this will purify it. I think the northern part of the county of Simcoe and the District of Muskoka are both very favourable districts for bee raising. I know that the district from Collingwood south is very favourable.

Wild Bees.

I don't think wild bees are found in Muskoka; but they are found very plentifully in the woods on the south coast of Georgian Bay. These would probably be escaped swarms. In Muskoka there are plenty of basswood and plenty of flowers; and I think bee keeping is an industry that might fairly be encouraged among the settlers in that district.

A Manual of Bee Culture.

To Mr. Malcolm.—The best course for a man to pursue who wants to raise bees simply to get honey enough to supply his own family, is to get five or six hives and read up Cook's Manual of Bee Culture; and if he writes to me I will give him all the information I can. Cook's Manual is decidedly the best manual on bee culture which has been published. I could teach any one in a short time to make artificial swarms, so that he might dispense with swarming altogether. But it is a very easy matter to get bees into a hive. At a cost of not more than fifty cents, you could make an arrangement, by fixing a crotch in the ground with a pole run through it, and a little box at one end balanced by a weight on the other, which would catch every swarm. There is no danger of being stung in handling bees; I can handle them just the same as flies without the slightest danger. It is a fact that some persons are more liable to be stung than others; but it is also a fact that a little child that has no fear may walk through a yard filled with bees and not be stung by them, when a grown person will. If you go into a yard and make false motions, and attempt to dodge the bees, they will most likely sting you; but if you go through a yard as though you were satisfied that they will not sting you, they are not likely to touch you. When you wish to get honey, all you have to do is to take your smoker and blow it into the hive; the bees will then commence to

fill themselves with honey, and you can take out the combs and brush the bees off the sides of them like flies, and then remove the honey. We have boys going in and working among our bees constantly, and they seldom get stung. This fear of stinging is a superstition. Every time a bee stings it leaves a little barb in the flesh; if you knock that barb sideways you will knock off the bag of poison, and no hurt will result; but if you attempt to pull it out, you will just squeeze the poison into the flesh. The poison is contained in a little bag at the end of the barb. The price of each of the queen bees which I brought from Cyprus was $15. I presume that they won't be more than $10 when the next shipment arrives. One great mistake of many people who keep bees is, that they try to keep a great many colonies, whereas they should endeavour rather to keep strong ones. My bees swarm from June till August; but the best swarms, as a general thing, are early. Sometimes, however, the late swarms are as good as the early ones. My hive is very large—from 3,000 to 3,500 cubic inches; 2,000 cubic inches is the largest that most people use. I am constantly making new hives by taking one comb from each of a number of hives, and here I let the bees begin to hatch another colony for themselves. The Italians, when kept strong, are moth proof, and the Cyprus bees are even more inclined to protect themselves than the Italians; but there is really no trouble from moths if the bees are properly kept.

D. A. JONES.

Mr. Jones, at the close of his evidence, showed the Commission a number of samples of grain collected by him throughout Palestine and Judea.

MR. P. C. DEMPSEY'S EVIDENCE.

The following evidence was given by Mr. Dempsey in the course of his examination on Fruit Growing and Forestry, at Toronto, June 10th, 1880. Mr. SAUNDERS in the chair.

Mr. P. C. DEMPSEY called and examined.

BEE KEEPING IN PRINCE EDWARD COUNTY.

To the Chairman.—Bee keeping is carried on pretty extensively in our district. We have some large bee farmers, while a number of others keep them in smaller numbers. We have a surplus of honey for the market, and it is usually shipped to different sections of the country, but consumed principally I think in our own Province. The price of honey depends very much on the kind; extracted honey will bring from eight to ten cents per pound, while good box honey sells for from ten to twenty. Our district is well adapted to bee farming, where there are broken sections of country and slovenly farming going on, it is generally favourable for bee culture. We have weeds which produce flowers that yield a good deal of honey. The golden rod is one plant, and from the Canada thistle a very delicious honey is gathered abundantly. In point of flavour, as far as my taste goes, there is nothing which will excel thistle honey. It is slightly yellow and beautiful in appearance. Next in point of flavour is that collected from white clover, which is also yellow. We can distinctly taste the fragrance of the clover in the honey gathered from that plant, as we can the distinctive flavour of the thistle in honey produced from it. The brightest we get and the one which commands the highest price is that from the basswood, as it is white as chalk and clear. The flavour is agreeable to almost all tastes, but it is not so delicious to mine as the other two I have named. There is a very rich quantity of honey comes from the buckwheat flowers, and enormous quantities are gathered from the flower of that plant. It has a strong ripe

flavour. Golden rod produces a very inferior quality of honey, though it appears to be well adapted to wintering bees. It resembles a mixture of honey and glucose. In fact some people take honey and mix it with glucose and sell it as golden rod honey. In opening a hive, though all classes of honey may be in the different combs, yet they are all separated. I have seen one kind on one side of the comb and another kind on the other side, but I never saw the different kinds mixed in the cells. I can always readily distinguish between the different kinds. It is more difficult to distinguish clover honey from thistle than to distinguish between any other two kinds, as both of them are yellow and very nearly alike.

Varieties of Bees.

We have both black bees and Italian bees in our district. Most of our successful bee keepers have introduced Italian bees. The Italian bee appears to be more hardy by itself, and is capable of defending itself in case of attack from other bees and from any other source. In that particular it seems tobe preferable to the common native bee. We find that by crossing the two varieties we get a still stronger bee, one which is capable of enduring a greater amount of exposure and cold, and a much more industrious bee. We have never introduced any other varieties of queens.

Production of Honey.

We could pick out a single colony and tell a story which would seem unreasonable; but the best year I had with sixty colonies I had three tons of box honey. The poorest year I had was an average of seventeen or eighteen pounds per colony. From that to a hundred pounds is the average, or say about thirty or forty pounds per hive. That is, of course, over and above the quantity required to winter bees. I have been engaged in bee culture about eighteen years. I do not think our district is quite as good as some others for profitable bee culture. There are no parts of Prince Edward County equal to some parts of Hastings, as some gentlemen in the latter county get fully double the quantity of surplus honey that I do. The reason is that they have an abundance of basswood trees and perhaps Canada thistles.

Management of Comb.

Where we meet with a misfortune we preserve the comb, if possible, to give to another colony. Then there are means of making artificial combs or comb foundations. They take type and set on a couple of rollers, and the wax is run through. In making our frames we have a groove cut in with a saw. We take a narrow strip of this foundation comb and insert it in that, and then we use a little kettle, made like a teapot, only it is double. The outside is filled with water and the interior with wax. The boiling water melts the wax, and we just pour a little of the hot wax along them and it seals perfectly. For extracting honey conveniently we must have a comb straight, and we accomplish that result in the way I have described. For breeding purposes, if it is straight it renders nearly all the comb valuable for the brood. If left to themselves the bees make it in all manner of shapes, some places too deep and some too shallow to be used for breeding purposes, consequently there will be only a small proportion of the comb that can be used by them. By using a foundation comb, though, they are perfectly straight. Then supposing a swarm issues in a season when there is an abundant supply of honey, their only object is to supply that honey to make what we call a drone comb. It has larger cells, and they will fill a whole hive. The practice of making an artificial comb is confined to large bee-keepers.

Description of Hives.

As to hives, any movable frame hive is, in my opinion, as good as another. We swarm the bees; you cannot always help it. The difficulty can be overcome to

some extent by moving the queen cells, although it is not always possible. Before the swarming season arrives, by putting up the outside combs—for the brood is always in the centre—and by sliding the ones in the interior out, and extracting the honey from these, and putting them in the centre, we can manage sometimes to prevent them swarming for a time.

Purity of Breeds.

We find a difficulty in keeping up the purity of our stocks. There would be no difficulty if everybody would look after their bees, but so far as my experience goes there is no object in keeping up thoroughbred bees only to obtain hybrids. The hybrids pay the best. Take a thoroughbred Italian colony and we can go almost in it and take it apart, as long as everything is done gently and quietly, and as long as we let them know we mean business, in a quiet way. They rarely attack any person. The hybrids are more ready to sting, and they resent attack at once.

Handling Bees—Feeding.

To Mr. Dymond.—There are some persons to whom bees are unfriendly: I used to be one of those persons myself; but if they get accustomed to you, and if you treat them properly, they will pay no attention and they will not sting you, even though they may alight upon your face and crawl over it, unless, indeed, you attempt to strike them; if you do they will immediately become aggressive. We scarcely ever feed our bees. We watch closely in the fall of the year and see that every colony is sufficiently supplied with honey before winter. If we find that any colony is not sufficiently supplied we supply the deficiency from those which have a surplus. We simply take the full combs of honey from the colonies that have too much and give them to those which have not enough, equalizing the quantity as nearly as possible. The class of honey which commands the best sale in foreign markets is the whitest you can get. Basswood honey commands the highest price. I am not aware of any foreign honey trade being carried on. I think it is all consumed in our own Province. I do not know that adulteration is practised to any great extent, at least I am not really aware of it, but I do know that some is adulterated.

The Bee Moth.

There is a moth which is very destructive to the bees. They destroy the bee when in the larval state, and by forming webs in the hive they prevent the bees from breeding. The larvæ of the insect destroy the larvæ of the bees. I think the moth lives on honey. I do not know of any other insect that is troublesome to the bees. The best way to meet this moth is to keep up the strength of the colonies and not allow any old combs around the apiary. The moth deposits its eggs in pieces of old comb and then they multiply. When the larvæ of the bees have just been sealed over, and while they are changing into the chrysalis form, the larvæ of the moth will feed along over their heads, and you will frequently notice the young bees with the heads eaten off in this way.

Winter Management.

To Mr. Byrne.—We winter bees in the house. We use a dark building with double walls to resist the frost as much as possible. To prepare our hives for winter, we remove the honey-board and we have a box made without a top or bottom so as to fit over the hive. We nail linen over the bottom of this and fill it with chaff, saw-dust, or anything that will act as an absorbent. We put another bit of linen in the same way over the top. This is the honey-board we use for the winter. We drop the bottom of the hive through the frames a little way so that in case any bees die during the winter they will pass out of the way of the combs. The saw-dust or chaff absorbs any moisture

[*Mr. Dempsey.*]

which would accumulate in the winter. Sometimes we lose a colony of bees. Supposing something happens the queen bee when we place them in the winter quarters and they are liable to be attacked by disease or old age, the colony perish when they are at that stage, because we cannot supply her place.

Life of Queens.

To Mr. Dymond.—Queens generally live from two to five years. When they grow old we replace them with young ones. In fact the bees themselves appear to supersede her when she grows old. You will sometimes find two in the same hive living on peaceable terms.

Epidemics.—Breeding Queens.

Bees are sometimes destroyed by an epidemic. I lost a whole apiary by what they call foul brood. It attacks the bees in the larval state while they are sealed. The young bees die, turn black, and rot away, so that there is a stench. I have no idea of the cause of the epidemic, but it is very contagious. The queen only meets the drone once in the course of her existence. I believe there are artificial means of allowing them to meet with the drone so that impregnation may take place with some degree of certainty. It is done with a barrel with a hole covered with glass. When the queen is ready to fly out to meet the drone they put her in the barrel, where there is a number of drones. She, in her effort to fly, goes to the glass where the drone meets her. Bees certainly feed a little during the winter. Large sheets of water are dangerous to bees. We lose great numbers when the hives are in proximity to streams or lakes. Bees very often settle on the stones near the water and are washed away. Sometimes in towns they will collect in stores, but they are easily let out by darkening all but the door. In winter we exclude all the light possible and endeavour to maintain the temperature at about forty degrees.

Adulteration of Honey.

I do not think honey can be adulterated without discovery. Any person who melts adulterated honey will readily discover that it is impure, from the fact that the adulterating substance will not readily dissolve. Glucose and rice meal are used for adulteration. Glucose costs about three cents per pound. A party in this city showed me some nice honey and wanted to know why mine did not resemble it. I told him that the difference was that mine was honey and his was not, and on melting the honey he was convinced that I was right. I am told the Americans feed the bees with glucose, and adulterate the honey in this way, but I have no knowledge of it. There was a consignment of such honey seized at Liverpool in the comb state, and it must have been adulterated in this way. It was confiscated.

Short Life of Bees.

To Mr. Aylesworth.—Q. What is the use of the queen bee to a colony in the winter time? A. The extreme age of the working bee is about six months, and they only attain that age in the winter season while living perfectly dormant. When the old bees take their first fly in the spring not more than one in twenty return to the hive. If we have a colony without a queen, when the hive goes into winter quarters, there is nothing in the spring but old bees, and the first fly they take they fail to return. They usually commence breeeding about the middle of February.

To the Chairman.—I should have told you how we manage to improve our stocks. We were talking about the introduction of queens, etc. We take the trouble to import a queen, say from a certain section of the United States, a thoroughbred Italian queen. As soon as she begins to deposit her eggs, we place comb containing eggs in a small hive in which there are some bees. They at once commence to form

queen cells. We then destroy the queen from the hive we wish to change, and introduce a cell in place of her as soon as we can. The other queen hatching meets the drone belonging to our hive and produces a cross. We are perpetually introducing crosses, because in-and-in breeding seems to have the same effect upon bees as upon other stock.

P. C. DEMPSEY.

MR. THOMAS BEALL'S EVIDENCE.

The following evidence was given by Mr. Beall in the course of his examination on Fruit Growing and Forestry, at Toronto, 11th June, 1880; Mr. AYLSWORTH in the chair.

BEE KEEPING IN THE LINDSAY DISTRICT.

To the Chairman.—I have had a little experience in bee-keeping. It is not carried on very extensively in our district. During the last year or two we have just about produced enough honey for the market. Last year there was no honey imported, while in previous years large quantities were brought in. I found that about 4,000 pounds were bought by grocers and private parties last year. I think our district is well adapted to bee farming, because, as far as I can judge, we have all the requisites for the production of honey on a large and profitable scale. There is one weed we have in some places, not mentioned by Mr. Dempsey, which is said to be very fruitful of honey, that is the mullein. I am told by a friend of mine, who has several colonies of bees, that it is honey and not pollen that the bees get from the mullein. There is another plant besides those mentioned by Mr. Dempsey, from which a great deal of honey is got, that is the dandelion. I think the honey from that plant is well flavoured. There is no honey that I like better. The honey does not seem to have the strong flavour of the dandelions. Then honey is also obtained from the soft maple, the hard maple, the gooseberry and the currant. We have most of the other plants mentioned, and there are besides, the thorn-apple, the raspberry, the asparagus, white clover and alsike clover. I agree with Mr. Dempsey as to the proper method of managing bees. As to the quantity of honey which a stock of bees should produce, those who get one hundred pounds think they have a good average; that is, one hundred pounds of surplus honey from each hive. We have no experts in our neighbourhood.

To Mr. Dymond.—I have the evidence of many persons in saying that one hundred pounds per hive would be a fair average. Last year I got seventy pounds of surplus from one hive. A good many Italian bees have been introduced lately, but not nearly so many as will be introduced this summer, as people are beginning to awaken up on the subject. Bee culture is becoming quite popular with us. I have no trouble with my bees in the winter time. One man lost forty colonies last winter by dysentery, caused by keeping them in a damp cellar. I keep mine in a cellar with the thermometer at about fifty degrees. I do not think it varied two degrees during the whole winter. I use knotting as a covering. I have only found a few dead bees, and their death I ascribe to natural causes. They were carried out of the hives by the other bees.

THOMAS BEALL.

Sittings to take oral evidence held at Perth, October 12th, 1880. *Present*—Mr. Edward Byrne (Chairman), and Mr. Dymond.

MR. JAMES MAITLAND'S EVIDENCE.

Mr. James Maitland, of the Township of Montague, County of Lanark, called and examined.

Bee-Keeping in Lanark.

To Mr. Dymond.—I am a farmer by profession. I own a farm of 150 acres. I have 26 colonies of bees. Bee-keeping is not carried on extensively in my district. All the bee-keeping is on a small scale. Bee-farming is however growing. I usually have a surplus and find a local market at 15 cents per pound for box honey. I think the district well adapted for bee-farming.

The Honey Harvest.

There is a large growth of clover and basswood giving superior honey and buckwheat for a lower class. The first honey of the season is in June—clover; then in July, the basswood. We get the buckwheat in August and up to September. I esteem the basswood most highly, then the clover, and the buckwheat last. Thistle honey is good and white, but thin, and does not crystallize freely. The buckwheat honey does not crystallize at all if pure.

Varieties of Bees.

There are three kinds of bees in our neighbourhood, the Italian, the hybrid and the club. I do not keep the last named myself. The Italian bee is milder in handling and a better honey gatherer by actual test. I have housed two swarms at the same time, and found the Italian to fill the hive, while the club hive would be only two-thirds full. The Italians are equally hardy. I think the Italians can pierce deeper into flowers than the others.

Imported Queens—Yield of Honey—Hives.

I raise my own queens, getting brood comb from a little distance. I have got some from Ohio to improve the stock. The lighter they are in colour the purer the stock seems to be. I think about 50 pounds of box honey is a fair average in one season from my hives. I use the Langstroth improved hive with an 11-inch frame. This allows the bees to form a better cluster in winter. We have used no extractors. I cannot pretend to say what we could get by that means. I approve of the use of artificial comb. I have tried the Thomas hive and the old Langstroth, but prefer the one I am now using. I find a great difficulty in keeping up the purity of my stocks, there are so many black stocks in the bush. If I find a colony deficient of food, I lift a frame or two out of a strong colony and give it to the weak one.

Winter Management.

I feed only with honey. I winter them below ground in a dry cellar, as the temperature is more even. The cellar is not quite frost proof. I never lost a swarm from want of honey in the summer. I believe the clover and basswood honey command the best price in the market. No adulteration I am aware of is practised in our section. Many persons have attempted bee-keeping in our district and failed. I think this was from want of proper attention, and keeping the bees in box hives instead of frame hives. We have no bee-keepers' association. We started one last fall but it fell through. The subject has not been brought before our Agricultural Society. The matter has been discussed among a few of us and more interest has been taken recently. We have decided to get extractors another year. We also intend to get the Cyprian bees and I have engaged to breed them for the neighbourhood.

[*Mr. Maitland.*]

Spring Treatment—Bee Moth—Damp.

Bees should be protected from the north and west winds in spring. If the supply of food is short owing to a dry season I would put two swarms together. In some cases bees are put out too early in the year. My place is high, and the snow leaves early. I get my bees out as early as I can. A good rule is to put them out as soon as insect life is seen on the wing. The bee moth troubles us. The remedy is to keep strong stocks, and to have only one entrance. In the box hives there is no protection against the moth, as the bees cannot go round every part of the box hive and discover their enemy. The bees properly kept are subject to no disease. The great trouble is damp in wintering.

Manipulation of Hive.

To Mr. Dymond.—I was the first to manipulate the bees artificially. With a frame hive I take out one frame with a queen and bees adhering to it, and put it into an empty hive with a foundation comb in it. You can get enough for 85 cents to fill up your hive and give you a month's advantage. I place the new hive in the old one's place, removing the old one 16 or 18 feet. With a common box hive I take it off to one side two or three rods out of the "fly" of the bees, and leave an empty hive on the stand as a decoy. I next turn the hive of bees upside down, putting an empty one on top, and hammer on the sides for 15 or 20 minutes, and then take the bees drummed off to one side and have an empty hive placed on a large cloth. The hive is placed there to receive the bees. The bees are shaken on to the cloth some two feet from the hive you want them to enter. I lift a few in a cup and pour them in front of the hive, when they will commence to drum and run in. This calls the rest, and if the queen is there they will stay. Before they enter, if you have got too many take away the hive with the queen and other bees, place it on the old stand, in place of the decoy, and let the balance run into the old hive. The old hive can then be put on a stand by itself, 16 or 18 feet away.

Swarming or Dividing.

To the Chairman.—If the bee-keeper has leisure it is well to let the bees swarm naturally, but my practice is to divide. This year I did not have one natural swarm. There is always a risk of losing the bees if they swarm. Once get them into a frame hive with brood, they will never leave it. I have never bred a non-swarming hive. By artficial swarming I save time, as a queen can be hatched out of brood comb in which a queen cell is sufficiently advanced, and a new swarm got by dividing, in ten days. I sometimes divide by taking out two frames with a queen and then put them on a stand a few feet from the old one, and in ten days divide the old hive again, thus getting two swarms from a hive in one year. I put bees into winter quarters about the 20th November. I have sometimes taken them out about the 30th March or 1st April. If they get one good fly in the early spring they will not come out again until there is work for them.

Marketing—Bee Pasture.

I have always done best by marketing in small glass boxes, holding three or four pounds. Honey may be kept from candying by heating it in the first instance. I believe bee-keeping on a large scale would be a good investment in this district. The pasture might be overdone, but not with any moderate number of hives. We have traced bees for a flight of four miles. I have frequently identified my Italian bees at a distance of two miles from home.

JAMES MAITLAND.

Witness adds as follows:

We keep about 50 sheep and contemplate increasing the number next year in view of the English demand. Our ewes are mixed Leicester or Cotswold, and we are crossing them with the pure-bred Southdown ram, and have got some fine lambs. I intend they shall be ready for the English market next July. The cross secures early maturity, being fit for mutton at a year old.

J. Maitland.

[*Mr. Maitland.*]

Statement Furnished at the Request of the Commissioners by Mr. S. T. Pettit.

Mr. S. T. Pettit, of Belmont, Township of South Dorchester, County of Elgin, having been prevented from attending a sitting of the Commission when notified, sends, at the request of the Commissioners, the following written statement:—

Bee Keeping in Elgin.

Bee keeping is not carried on extensively in this district. The number of colonies kept by different persons varies from one to seventy in their respective yards.

Markets for Surplus—Prices.

My surplus stock of honey is sold to private persons and in the cities and towns west of Hamilton, at from 11c. to 12c. per pound, wholesale price. It is a serious drawback to bee keeping in this district that the land is so uniformly good, there is but little waste land to supply late and early bee pasture. The honey, however, is of the best quality.

The Sources of Honey Supply.

The honey is principally gathered from fruit blossoms, white clover, and lindens. From the fruit blossoms it is dark, from the clover and lindens it is clear and bright and of the very best quality.

Breeds of Bees.

My own bees are Italians but my neighbours use the native or black bee. I have no experience with any but the black and Italian bees. The Italians are superior to the black in the following particulars: they are more gentle under manipulation; they protect themselves from robbers and the ravages of the bee moth; they are more industrious when honey is scarce. When, however, there is a good flow of honey the black bees are equal to the Italians. I obtain my supply of queens (pure Italians) from reliable breeders in the United States and Canada. The Cyprians are pretty bees, but I am not acquainted with their other qualities.

Average Yield of a Season.

As kept in this neighbourhood, a hive averages perhaps about 20 pounds of honey in a season, but if kept on scientific principles they would do far better—perhaps average 80 pounds. Although the quantity, for reasons mentioned, may be a low average, the quality is equal to that of any honey in the world. I have compared my honey with that from many parts of the United States, including California, and find my honey second to none in quality.

Comb and Comb Frames.

I use comb foundation for the brood chambers and for extracting purposes. I prefer a movable comb frame hive, with a top story, which should be removed in winter.

Difficulty in Keeping Stocks Pure.

The presence, in the immediate neighbourhood, of colonies of black bees makes it very difficult to keep the stocks pure. About one half or more of my young Italian queens mate with the native (black bee) drones.

[*Mr. Pettit.*]

Feeding Bees.

I seldom or never feed the bees except they lack stores to carry them through the winter. In that case I dissolve standard granulated sugar, in the proportion of five pounds of sugar to one quart of water, bring it to a boil, and it is ready for use.

Winter Quarters.

For winter the bees are placed in a box with a space of two inches round about the hive, which space is filled with wheat chaff. For convenience the box is hooked together at two opposite corners, while the other two corners are nailed. I place a cloth and mat on the top.

Spring Treatment.

In wet seasons I just let them wait for dry weather. Of course, I would feed them if they ran short of stores. I never feed anything but honey in spring or summer, and so, during the honey season, have nothing but pure honey in the hives. I always avoid all glucose and grape sugar for bee feed. I have had no experience in the foreign markets for honey, but doubtless the clover and linden honey would bring the highest price.

California Honey.

From Canada, at present, the foreign trade is carried on in a small and private way. Hundreds of tons of honey are purchased annually in California for the English market, at from five to eight cents per pound, the cost of carriage not being more than one cent per pound. California honey is proverbial for its superior quality when left with the bees till ripe or partly capped.

Adulteration—Unripe Honey.

I do not think adulteration is practised to any extent in this country, although I have met with some adulterations here. The practice of extracting thin or unripe honey should be discouraged, especially in view of our seeking a foreign market for our surplus. The best article is needed to secure the best prices.

Insects Injurious to Bees—Granulated Honey.

I know of no insects in Ontario injurious to bees, but they are numerous in the Southern States. All pure honey will granulate (or candy) sooner or later. By placing the honey jar or tin in water, and applying a gentle heat slowly, the honey can be liquified at any time without the least injury to its flavour.

Diseases of Bees.

Of diseases, bees are subject to what is known as foul brood, and to dysentery. The former is infectious and fatal, whole apiaries being sometimes lost by it. Dysentery, although causing great mortality among bees annually, is not, properly speaking, a disease, but the result of unfavourable conditions. If these be removed dysentery will disappear with them. To secure the best results apiaries should be located at least five miles apart.

S. T. PETTIT.

ANSWERS—FORWARDED AT THE REQUEST OF THE COMMISSIONERS, BY THE HON. LOUIS WALLBRIDGE, OF BELLEVILLE—TO QUESTIONS ON BEE-KEEPING.

1. Is bee-keeping carried on at all extensively in the County of Hastings?

Yes; there are at least half a dozen persons who keep from 50 to 150 colonies, and extract the honey; there are a great many who keep from 20 to 50, and rely upon box honey or upon section boxes.

2. Is it practised by persons on a small scale, or have you any large bee-farms?

The answer above covers this. The pursuit is rapidly increasing, as this part of Ontario seems well adapted to that business.

3. Have you a surplus of honey for market; if so, how is it disposed of, and at what price?

There is much more gathered than there is a market for here; some is sent to England, some to Toronto, and to Orillia and western towns. Price generally 10 cents wholesale, extracted, and 12½ cents box honey.

4. Is your district well adapted for bee-farming?

I think so. The much vaunted Western States suffer from drouths—which are very injurious to bee-keeping. Here, on the contrary, from spring until late in the fall, the bees gather all the time, though sometimes more than at others.

5. In what respect does it present special advantages for this pursuit?

There is a continual succession of blossoms, from spring till fall, excepting about two weeks, after bass-wood blossom, from July 20th to August 7th.

6. What flowers, plants or trees do the bees most resort to; what is the character of the honey collected from the respective sources of supply, and from what source is the best quality of honey obtained?

Willows, soft maple, hard maple, elm, fruit trees, white clover, alsike clover, thistle, bass-wood. The Italian bees do work a little on red clover, sweet alders, the mint tribe of flowers (mignionette, peppermint, catnip, motherwort), buckwheat, golden rod, and other flowers, names of which I don't know.

7. Of what stock are the bees in your district mainly?

Italians.

8. Can you describe the characteristics of the different varieties of bees?

Black bees are understood to be the English or German. The Italians are a better sort. The Cyprus bee is now just introduced, but not tried yet. The common black bee of the woods is the English or German bee. People speak of the grey bee, but when examined, it is the common black bee.

9. Whence do you secure your supply of queens, and what queens do you prefer for the improvement of the stocks?

Italians, thus far. Originally, we imported Italians from Quinly, New York, Langstroth, Ohio, Dudunt, Michigan; but now we have as fine bees as can be imported, raised here. W. C. Wells, of Phillipston P.O., raises as fine as I have ever seen. He will shortly raise Cyprus queens from Jones' importations from Cyprus.

10. What quantity of honey does a stock of bees average in one season?

Last year, 1879, a very good year, each hive, taking that as the basis of calculation, averaged 98 pounds, extracted. This is more than a general average—perhaps 75 pounds would be a fair average; 40 pounds would be a fair average of box-honey. I have taken 101 pounds from one hive, and a swarm, box honey. This is extraordinary.

[*Hon. L. Wallbridge.*]

11. Is the average as good in quantity and quality in your district as in other countries or in other parts of this Province?

Fully up to the best. We think the white clover and bass-wood the best. The thistle is excellent, but not so abundant as to quantity. I find the bee-keepers overestimate. The occupation is of an exciting character, which may account for it. My opinion is that Ontario is one of the best, if not the best country for bee-keeping on this continent. There are in all the accounts you see published a great deal of brag, for which allowance must be made, expecially in the United States.

12. Do you adopt any method of supplying the bees with comb?

W. C. Wells manufactures excellent foundation both for the Brown chamber and honey boxes or supers. There are other manufacturers of foundations in this county as well as Mr. Wells Lewis Searles, Foxboro' P.O., is one of them. Every intelligent bee-keeper uses foundation either for the whole frame or as starters.

13. What kind of hive do you consider best?

The Langstroth. I prefer a modification—a little deeper and shorter. The contents ought to be about 2,000 inches cubic.

14. With pure-bred queens, do you find any difficulty in keeping up the purity of your stocks?

Not much. It requires attention, but can easily be done. The drones of hybrids are pure.

15. How do you feed your bees, and in what way are they protected in winter?

Only bad bee-keepers feed bees, or in a poor bee country. A little food in spring to stimulate is of doubtful good—the quieter the better in the spring. We winter in winter depositories, temperature at 41°—45 .

16. What is your treatment of the bees in wet seasons?

Our climate makes no demand for extreme drouth or extreme wet. These are great disadvantages under which we do not suffer.

17. What class of honey commands the best sale in the foreign market?

Clover, bass-wood and thistle. I have been surprised at the preference in England for buckwheat.

18. How is the foreign trade in honey carried on?

Only in its infancy; generally individual consignments to persons with whom connection has been formed.

19. Is adulteration practised to any extent, to the prejudice of the honest dealer?

Not at all in Canada.

20. What insects are destructive or injurious to bees?

The moth; but with a good hive, the Italians protect themselves. The writer has not seen one this year.

21. What methods are best adapted to counteract their ravages?

Good hives, strong colonies, and attentive bee-keepers. The moth is a just punishment for the inattentive sloven.

22. To what diseases are bees subject; and are stocks often lost from such causes?

Foul brood is the only disease; never heard of it but once in this part of Canada. The best cure is to burn the whole thing up, and begin again. This is the cheapest—the labour of curing foul brood costs more than the value of the bees.

[*Hon. L. Wallbridge.*]

ONTARIO AGRICULTURAL COMMISSION.

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